# CITY COUNCIL MEETING

**Monday, August 05, 2024 at 7:00 PM**
**Sandy City Hall and via Zoom**

## AGENDA

**TO ATTEND THE MEETING IN-PERSON:**
Come to Sandy City Hall (lower parking lot entrance) - 39250 Pioneer Blvd., Sandy, OR 97055

**TO ATTEND THE MEETING ONLINE VIA ZOOM:**
Please use this link: https://us02web.zoom.us/j/82062618022
Or by phone: (253) 215-8782; Meeting ID: 82062618022

**PLEDGE OF ALLEGIANCE**

**ROLL CALL**

**CHANGES TO THE AGENDA**

**PUBLIC COMMENT (3-minute limit)**

The Council welcomes your comments at this time. The Mayor will call on each person when it is their turn to speak for up to three minutes.

**-- If you are attending the meeting in-person**, please submit your comment signup form to the City Recorder before the regular meeting begins at 7:00 p.m. Forms are available on the table next to the Council Chambers door.

**-- If you are attending the meeting via Zoom**, please complete the online comment signup webform by 4:00 p.m. on the day of the meeting: https://www.ci.sandy.or.us/citycouncil/webform/council-meeting-public-comment-signup-form-online-attendees.

**RESPONSE TO PREVIOUS COMMENTS**

**CONSENT AGENDA**

1. City Council Minutes: July 15, 2024
2. Resolution 2024-19: WIFIA Loan Agreement for Wastewater Improvements
3. Purchase Authorization: Membrane Equipment for Alder Creek Water Treatment Plant Upgrades
4. Resolution 2024-20: 2024 Emergency Operations Plan Update

**PRESENTATIONS**

5. Police Chief Huskey Oath of Office

**NEW BUSINESS**

6. Intergovernmental Agreement with Sandy Urban Renewal Agency
7. Purchase Authorization: New Taser Units

**REPORT FROM THE CITY MANAGER**

**COMMITTEE / COUNCIL REPORTS**

**STAFF UPDATES**

Monthly Reports: https://reports.cityofsandy.com/

**ADJOURN**

Americans with Disabilities Act Notice: Please contact Sandy City Hall, 39250 Pioneer Blvd. Sandy, OR 97055 (Phone: 503-668-5533) at least 48 hours prior to the scheduled meeting time if you need an accommodation to observe and/or participate in this meeting.

# CITY COUNCIL MEETING

**Monday, July 15, 2024 at 6:00 PM**
**Sandy City Hall and via Zoom**

## MINUTES

**WORK SESSION**

1. Emergency Operations Plan Update

The Interim Police Chief summarized the staff report, which was included in the meeting packet along with presentation slides. It was noted that this work session provided an opportunity for the Council to provide feedback and ask questions, in anticipation of plan adoption at the next meeting. It was also noted that applicable sections of the municipal code should be updated.

Council discussion ensued on the following topics:

- Clarification on emergency declaration procedures
- Clarification on who would serve as incident commander, depending on the nature of the emergency
- Clarification on management of the emergency operations center
- Inquiry as to how coordination occurs between agencies when multiple entities activate their emergency plans
- Discussion on the life cycle of emergency management
- Lines of succession for operations and policymaking roles
- Suggestion that a dedicated emergency manager position is necessary
- Suggestion to conduct emergency operations center training
- Overview of the different sections within the emergency operations center; discussion of logistics including checklists, timelines, and priorities
- Discussion of the role of the Council during a disaster
- Inquiry about quorum requirements during an emergency; staff will follow up with more information
- Discussion on the need to ensure seamless radio communication between different departments; overview of the FirstNet phone system
- Emphasis on the need for regular training and planning exercises
- Acknowledgement of the Police Department as a rally point
- Emphasis on the importance of coordination with community partners, including the school and fire districts, Clackamas County, and local nonprofit and healthcare organizations, with regard to planning, preparation, and relationship building

- Note of the City's IGA with other municipalities regarding employee sharing in emergencies

It was the consensus of the Council that the following should be addressed by staff:

- Add information to the plan concerning coordination with Mt Hood National Forest personnel in the event of a fire or similar emergencies
- Include an emergency phone contact list in the plan, with city staff contacts as well as key community partners (other agencies, contractors with City partnership agreements, etc)
- Procure extra radios to ensure seamless communication between staff members
- Ensure that lower-level staff cannot authorize spending without proper approval from supervisors

**REGULAR MEETING**

**PLEDGE OF ALLEGIANCE**

**ROLL CALL**

**PRESENT**
Council President Laurie Smallwood
Councilor Chris Mayton
Councilor Rich Sheldon
Councilor Kathleen Walker
Councilor Carl Exner

**ABSENT**
Mayor Stan Pulliam
Councilor Don Hokanson

**CHANGES TO THE AGENDA**

(none)

**PUBLIC COMMENT (3-minute limit)**

Doug Castle: regarding the advance financing reimbursement district (AFRD), stated that the map used to determine developable acreage was incorrect and/or inconsistent with data used during the property acquisition process; stated that different zoning of the affected properties was not considered; asked whether the development moratorium affects the effective dates of the AFRD; stated that he lacks certainty on when interest begins to accrue. Staff will follow up with Mr. Castle to address his questions.

**RESPONSE TO PREVIOUS COMMENTS**

(none)

**CONSENT AGENDA**

2. City Council Minutes: June 17, 2024
3. Resolution 2024-16: Natural Hazard Mitigation Plan Update 2024

**MOTION: Adopt the Consent Agenda**

Motion made by Councilor Exner, Seconded by Councilor Mayton.

Voting Yea: Council President Smallwood, Councilor Mayton, Councilor Walker, Councilor Exner

Abstaining: Councilor Sheldon

**MOTION CARRIED: 4-0-1**

**NEW BUSINESS**

4. Design for Meinig Memorial Park Improvements and Restoration

The Parks and Recreation Director summarized the staff report, which was included in the meeting packet along with presentation slides. Brian Martin with Lango Hansen was present to deliver the slide presentation. It was noted that the improvement tasks considered during this design effort included the following possibilities: Fantasy Forest restoration, trail improvements, a new dog park, creek restoration, and in-hill audience seating for the stage.

Council discussion ensued on the following topics:

- Explanation of the accessibility and inclusivity updates being considered
- Recap of the recent Parks and Trails Advisory Board meeting, and the project prioritization input provided by the Board
- Suggestion to add a picnic shelter, embankment slide, and small restroom facility as was considered in the past; history and context of past park improvement planning
- Overview of budget figures
- Suggestion to prioritize projects, because of limited funds; suggestion that safety and legal compliance should be given top priority
- Note that the next budget process will determine the level of funding available for park projects
- Suggestion that SDCs should be the primary funding source
- Discussion on the degree of consistency that exists between these project proposals and the capital needs listed in the Parks and Trails Master Plan; note that the needs of Fantasy Forest are now better understood and are more acute from a safety perspective
- Concern about the state of the park's trails, especially given Winterfest activities; note that trail improvement bid documents already exist
- Details about the particular safety concerns that exist in Fantasy Forest; concerns about the possible need to temporarily close Fantasy Forest for safety reasons
- Optimism that a grant can be secured to repair Fantasy Forest

- Note that tires are no longer considered safe play elements
- Discussion on possibilities for phasing and triaging work as needed
- Lessons learned from other cities regarding the need to gather community input into park projects
- Possibilities for other funding sources, including stream restoration grants and urban renewal funding for parking; discussion on improvement logistics for the lower City Hall parking lot

5. Council Feedback: Proposed C-4 Joint Values and Outcomes for State Transportation Package

   The City Manager provided an overview of the issue and the proposed value statements from the C-4 group. Council discussion ensued on topics below. The City Manager stated he would relay the Council's thoughts back to C-4.

   - Suggestion that this is a County document that does not need local endorsement
   - Suggestion that the document does not reflect the needs and interests of smaller rural communities
   - Concern that often, urban metro issues are prioritized to the detriment of rural needs
   - Concern about local road improvement needs including the Ten Eyck / Hwy 26 intersection and the Hwy 211 / 362nd Avenue intersection
   - Suggestion that the City should be collaborative to the extent possible and offer constructive edits to the document, potentially with the assistance of other rural communities
   - Suggestion that more specific language is needed in the document
   - Suggestion for the City to formally identify the County road improvements most desired
   - Concern about the cost of Hwy 211 pedestrian improvements
   - Recognition that rural residents work in urban areas, which creates road and traffic impacts
   - Recognition of regional impacts on Sandy due to traffic on Hwy 26

**REPORT FROM THE CITY MANAGER**

- Recap of staff meeting with Representative-elect Drazan about the City's wastewater challenges and suggestions for securing support from the State; observations on forging partnerships with other legislators; suggestion to prioritize assistance for wastewater projects, despite the transportation focus of the upcoming session, because of the continuing nexus with the State's housing priorities.
- Next Council meeting will address wastewater funding, including WIFIA financing
- First movie in the park is taking place next week
- Sandy Mountain Festival was a success
- Individuals without housing were sheltered in the Best Western during the recent heat wave; no incidents occurred
- LOC's annual conference will be held in Bend in October
- A code enforcement policy subcommittee meeting will be scheduled for an upcoming Friday

**COMMITTEE / COUNCIL REPORTS**

Councilor Exner

- Revisiting the issue of the new Bell Street extension and whether enough room exists for emergency vehicles to pass stopped traffic; it was recently shown that a fire truck could pass a police car that was fully pulled over to the side of the street, but such a maneuver is not practical.
    - A meeting will be held with school district leaders in the near future to discuss solutions to the school-related congestion issues; possibilities exist to change the location of pickup and drop off.
    - Suggestion to use a traffic engineer to forge a long-term solution; interim improvement measures may be needed when the new school year begins
- Praise for first responders who recently assisted with a family health emergency
- Suggestion to review Mountain Festival operations to find areas for improvement
- Praise for improvements to vegetation maintenance

Councilor Walker

- Overview of the Library Advisory Board 's work on strategic plan updates
- Updates on the Board of County Commissioners' consideration of the proposal to assist with Hoodland Library's rent costs
- Thanks to Clackamas County Bank for their support of the fireworks display
- Appreciation for the Mountain Festival volunteers
- The wastewater oversight committee received a facilities plan briefing; an important discussion with the full Council is upcoming

Councilor Sheldon

- Thanks to Clackamas County Bank for their support of the fireworks display
- Reminder on the need for an employee volunteer program
- Suggestion to ensure that parking for the new townhomes on Meinig Ave does not impact the City's adjacent parking lot
- Suggestion to convene the homelessness task force to review regulations, policies, and practices in light of the recent Supreme Court ruling in the Grant's Pass case

Councilor Mayton

- Thanks to Clackamas County Bank for their support of the fireworks display
- Appreciation for the Mountain Festival volunteers

Council President Smallwood

- Thanks to Clackamas County Bank for their support of the fireworks display
- Regarding homelessness regulations: note that HB 3115 still applies in Oregon and the situation will likely continue to evolve. Staff would benefit from clearer enforcement direction.

**STAFF UPDATES**

Monthly Reports: https://reports.cityofsandy.com/

**ADJOURN**

# STAFF REPORT

| | |
|---|---|
| **Meeting Type:** | City Council |
| **Meeting Date:** | August 5, 2024 |
| **From:** | Jennifer Coker, Public Works Director |
| **Subject:** | Resolution 2024-19: WIFIA Loan Agreement for Wastewater Improvements |

**DECISION TO BE MADE:**

Whether to adopt Resolution 2024-19, approving the form of WIFIA Loan Agreement 1 with the United States Environmental Protection Agency for up to $24,738,640, and delegate to staff authority to make changes to, and finalize the form of, the WIFIA Loan Agreement.

**PURPOSE / OBJECTIVE:**

On June 17, 2024, the City Council adopted Ordinance No. 2024-15 authorizing the issuance of sewer revenue bonds in a principal amount not to exceed $24,738,640 to fund planning for and capital improvements to the City's sewer system (the "Projects"), plus additional amounts to pay capitalized interest, fund bond reserves for the revenue bonds authorized by this resolution and to pay costs of issuance of the revenue bonds. The City estimates that the total amount of revenue bonds required for this purpose will not exceed $34,738,640 (the "Bond"). The referral period for the Ordinance has expired and no petitions were received. The effective date of the Ordinance is July 17, 2024, and the City may proceed with the issuance of the Bond described in the Ordinance.

The Ordinance delegates authority to staff to issue the Bond. The Resolution approves the form of the WIFIA Loan Agreement which provides the terms under which the City will issue a the Bond under the authority of the Ordinance.

**BACKGROUND / CONTEXT:**

The Sandy Clean Waters Program ("SCWP") will complete a series of wastewater system improvement projects to bring operations of the City's wastewater collection, treatment, and discharge facilities into compliance with federal and state effluent discharge regulations. The current SCWP project involves repair/replacement/maintenance projects to improve reliability of the existing wastewater treatment facility; planning and permitting for a new Sandy River outfall; design and construction of collection system improvements; and program management and project management of planning, design, permitting, and construction activities.

The SCWP scope will be clarified through the Wastewater Facilities Plan update that is currently in progress. The SCWP will also be funded in part by SRF Loan #2, by SRF Loan #3 which was executed in August 2023, and by the proposed WIFIA Loan.

Table 1 summarizes the Clean Waters Program Wastewater Improvements Financing Package plans:

**Table 1: Sandy Clean Waters Program Wastewater Improvements Current and Proposed Financing**

| Project | Date of issuance | Loan | Lender | Status | Loan Amount | Project Phase |
|---|---|---|---|---|---|---|
| Existing WWTF Facility Reliability Improvements, Outfall to Sandy River, Collection System Improvements | August 1, 2017 | SRF Loan R80491 See Note 1 | Oregon DEQ | Complete | $799,425 | Facility Planning |
| | April 7, 2021 | SRF Loan 2 R80492 | Oregon DEQ | Complete | $20,700,000 | Design and Construction |
| | August 2, 2023 | SRF Loan 3 R80493 See Note 2 | Oregon DEQ | Complete | $7,300,000 [46,000,000] | Design and Construction |
| | TBD | Revenue Bond (this resolution) | WIFIA (US EPA) | Application in Process | $24,738,640 + Capitalized Interest | Design and Construction |
| | TBD | Revenue Bond TBD See Note 3 | WIFIA (US EPA) | Not Started | TBD | Design and Construction |
| Total Financing Package | | | | TBD | TBD | TBD |

**Table Notes**

**Note 1:** R80491 was secured and expended for facility planning work that was completed prior to the start of Sandy Clean Waters Program (SCWP) and will not be utilized to fund SCWP improvements. It is included in this table as one of the debts that is secured by wastewater revenues, as are the other loans listed in the table.

**Note 2:** DEQ has authorized R80493 for a total loan amount of $46,000,000, of which to date $7,300,000 has been approved. DEQ has stated its intent to approve the remaining amount of the loan when the City has completed its planning and identified the scope of the remaining improvements.

Note 3: After the update to the Wastewater Facilities Plan October 2019 is completed, City anticipates applying for a second WIFIA loan to complete SCWP funding.

**KEY CONSIDERATIONS / ANALYSIS:**

The funding package for this project involves loans that will be repaid over time from wastewater system rate revenue.

Although the interest rate on the currently proposed WIFIA loan is a market rate, the WIFIA program offers other critical features that significantly reduce the impact of that debt repayment obligation on ratepayers. First, unlike standard revenue bonds where the full bond amount is delivered and starts accruing interest upon issuance, interest costs on the WIFIA loan will be accrued more slowly because it is set up to be disbursed over time on a reimbursement basis as expenses are incurred. While loan closing is anticipated to occur in August 2024, disbursement of the majority of the funds is not expected to occur until the years 2025 and 2026 over a period of multiple years.

Second, the WIFIA program allows for the commencement of loan repayment to be deferred up to 5 years after substantial completion of the project in 2028. For this loan, that means that the repayment period is not expected to commence until December 2032. Accrued interest on the deferred payments is added to the loan amount (referred to as “capitalized interest”). The combination of those two features allows increases in wastewater rates to be phased in over a longer period and spreads the impact of those rate increases over what is expected to be a larger customer base over time.

Because DEQ has designated the existing Clean Water State Revolving Fund (SRF) Loan #2 as being state-funded, the City’s WIFIA application has designated a portion of those loans ($6,631,088) to satisfy the WIFIA requirement for a non-federal match.

**BUDGET IMPACT:**

WIFIA is offering a loan in the maximum amount of $24,738,640, plus capitalized interest in the maximum amount of $10,000,000, with payments over a 30-year period starting in 2032. The interest rate will be established on the date of closing, calculated at the interest rate on closing day for a Treasury bond with a comparable average life to the bonds plus one basis point. Over the last 45 days, the estimated interest rate for the issue has ranged from 4.36% - 4.69%.

The Authorized Representative will execute documents and establish the final terms under the authority granted in the Ordinance. Repayment is made from wastewater water rate revenues and is included in the rate model.

**RECOMMENDATION:**

Staff recommends Council adoption of Resolution 2024-19.

**SUGGESTED MOTION LANGUAGE:**

“I move to adopt Resolution No. 2024-19.”

**LIST OF ATTACHMENTS / EXHIBITS:**

- Resolution 2024-19
    - Exhibit 1 – Form of the WIFIA Agreement
- Draft Opinion of City Attorney

WHERE INNOVATION MEETS ELEVATION

**RESOLUTION NO. 2024-19**

**A RESOLUTION APPROVING THE FORM OF A WIFIA LOAN AGREEMENT**

**WHEREAS**, on June 17, 2024, the City of Sandy, Oregon (the "City") authorized the issuance of revenue bonds pursuant to ORS 287A.150 and related provisions of ORS Chapter 287A under Ordinance No. 2024-15 (the "Ordinance"); and

**WHEREAS**, the referral period for the Ordinance has expired, no petitions were received, and the City may proceed with the issuance of the revenue bond described in the Ordinance; and

**WHEREAS**, the City Council of the City adopts this resolution to approve the form of a Water Infrastructure Finance and Innovation Act (WIFIA) Loan Agreement with the United States Environmental Protection Agency, an agency of the United States of America, acting by and through the Administrator of the Environmental Protection Agency (the "WIFIA Lender"), that provides certain terms for a revenue bond authorized under the Ordinance and related matters.

**NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SANDY:**

**Section 1: Adoption of Resolution.** The City Manager, the Deputy City Manager, the Public Works Director, or the Finance Director, a designee of any of those officials or other designee of the City Council (each of whom is referred to in this resolution as an "Authorized Officer") is authorized to finalize, execute, and deliver the WIFIA Loan Agreement and Bond on behalf of the City in substantially the form attached as Exhibit 1, with such changes as are approved by the Authorized Officer. Pursuant to ORS 287A.310, subsequent bonds of the City may be secured by the Wastewater System net revenues, subject to the terms of the existing obligations secured by the City's Wastewater System net revenues, including the WIFIA Loan Agreement.

**Section 2: Official Actions.** The Authorized Officer is hereby authorized and directed, for and in the name and on behalf of the City, to do any and all things and take any and all actions including execution and delivery of any and all assignments, certificates, requisitions, agreements, notices, consents, instruments of conveyance, warrants and other documents, and to establish any funds and accounts, which may be necessary or advisable in order to consummate the transactions described herein and, including without limitation, any and all documents and agreements required by the WIFIA Lender in connection with the WIFIA Loan Agreement. Any such actions previously taken by such officers in furtherance of this resolution are hereby ratified and confirmed. The Ordinance remains in full force and effect and has not been amended, revised, or repealed.

**Section 3: Effective Date**. This resolution shall take effect on the date it is adopted.

This resolution is adopted by the City Council of the City of Sandy this 5th day of August, 2024.

_____

Stan Pulliam, Mayor

ATTEST:

_____

Jeffrey Aprati, City Recorder

**Exhibit 1**

**Form of WIFIA Loan Agreement**

HDW Draft 7/18/2024
WIFIA CUSIP Number: [___]

# UNITED STATES
# ENVIRONMENTAL PROTECTION AGENCY

# WIFIA LOAN AGREEMENT

## For Up to $24,738,640

## With

## CITY OF SANDY, CLACKAMAS COUNTY, OREGON

## For the

## SANDY CLEAN WATERS PROGRAM PROJECT
## (WIFIA ID – 20126OR)

Dated as of [___], 2024

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# WIFIA LOAN AGREEMENT

**THIS WIFIA LOAN AGREEMENT** (this "**Agreement**"), dated as of the Effective Date, is by and between the Borrower (as defined herein) and the **UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**, an agency of the United States of America ("**EPA**"), acting by and through the Administrator of the Environmental Protection Agency (the "**Administrator**"), with an address at 1200 Pennsylvania Avenue NW, Washington, DC 20460 (the "**WIFIA Lender**").

## RECITALS:

WHEREAS, the Congress of the United States of America enacted the Water Infrastructure Finance and Innovation Act, § 5021 *et seq.* of Public Law 113-121, as amended by Section 1445 of the Fixing America's Surface Transportation Act of 2015, as further amended by Section 5008 of the Water Infrastructure Improvements for the Nation Act of 2016, Section 4201 of America's Water Infrastructure Act of 2018, and by Sections 50214 and 50215 of the Infrastructure Investment and Jobs Act of 2021 (collectively, as the same may be amended from time to time, the "**Act**" or "**WIFIA**"), which is classified at 33 U.S.C. §§ 3901-3915;

WHEREAS, the Act authorizes the WIFIA Lender to enter into agreements to provide financial assistance with one or more eligible entities to make secured loans with appropriate security features to finance a portion of the eligible costs of projects eligible for assistance;

WHEREAS, the Borrower has requested that the WIFIA Lender make the WIFIA Loan (as defined herein) in a principal amount not to exceed the Maximum Principal Amount (as defined herein) to be used to pay a portion of the Eligible Project Costs (as defined herein) pursuant to the Application (as defined herein);

WHEREAS, pursuant to the WIFIA Term Sheet (as defined herein), the Administrator has approved WIFIA financial assistance for the Project (as defined herein) to be provided in the form of the WIFIA Loan, subject to the terms and conditions contained herein;

WHEREAS, based on the Application and the representations, warranties and covenants set forth herein, the WIFIA Lender proposes to make funding available to the Borrower for a portion of the costs of the Project through the issuance of the WIFIA Bond (as defined herein), upon the terms and conditions set forth herein;

WHEREAS, the Borrower agrees to repay any amount due pursuant to this Agreement and the WIFIA Bond in accordance with the terms and provisions hereof and of the WIFIA Bond; and

WHEREAS, the WIFIA Lender has entered into this Agreement in reliance upon, among other things, the information and representations of the Borrower set forth in the Application and the supporting information provided by the Borrower.

NOW, THEREFORE, the premises being as stated above, and for good and valuable consideration, the receipt and sufficiency of which are acknowledged to be adequate, and intending

to be legally bound hereby, it is hereby mutually agreed by and between the Borrower and the WIFIA Lender as follows:

## ARTICLE I
## DEFINITIONS AND INTERPRETATION

Section 1. Definitions. Capitalized terms used in this Agreement shall have the meanings set forth below in this Section 1 or as otherwise defined in this Agreement, except as otherwise expressly provided herein. Any term used in this Agreement that is defined by reference to any other agreement shall continue to have the meaning specified in such agreement, whether or not such agreement remains in effect.

"**Act**" has the meaning provided in the recitals hereto.

"**Additional Parity Obligations**" means any Parity Obligations permitted under Section 15(a) (*Indebtedness*), which Parity Obligations are issued or incurred after the Effective Date that ranks *pari passu* in right of payment and right of security with the WIFIA Loan. Restrictions on the issuance or incurrence of Parity Obligations are described in Section 15(a) (*Indebtedness*).

"**Additional Parity Obligations Test**" has the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Additional Construction Contract**" means, with respect to the Project, each Construction Contract entered into after the Effective Date.

"**Additional Obligations**" means Additional Parity Obligations and Subordinate Obligations.

"**Administrator**" has the meaning provided in the preamble hereto.

"**Agreement**" has the meaning provided in the preamble hereto.

"**Application**" means the Borrower's application for WIFIA financial assistance received by the WIFIA Lender on the Application Receipt Date.

"**Application Receipt Date**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Auditor**" means a person authorized by the State Board of Accountancy to conduct municipal audits pursuant to ORS 297.670.

"**Authorizing Ordinance**" has the meaning ascribed to such term in **Part E of Schedule I** (*WIFIA Loan Specific Terms*).

"**Authorizing Resolution**" has the meaning ascribed to such term in **Part E of Schedule I** (*WIFIA Loan Specific Terms*).

"**Bankruptcy Related Event**" means, with respect to the Borrower, (a) an involuntary proceeding shall be commenced or an involuntary petition shall be filed seeking (i) liquidation, reorganization or other relief in respect of the Borrower or any of its debts, or of a substantial part of the assets thereof, under any Insolvency Laws, or (ii) the appointment of a receiver, trustee, liquidator, custodian, sequestrator, conservator or similar official for the Borrower or for a substantial part of the assets thereof and, in any case referred to in the foregoing subclauses (i) and (ii), such proceeding or petition shall continue undismissed for sixty (60) days or an order or decree approving or ordering any of the foregoing shall be entered; (b) the Borrower shall (i) apply for or consent to the appointment of a receiver, trustee, liquidator, custodian, sequestrator, conservator or similar official therefor or for a substantial part of the assets thereof, (ii) generally not be paying its debts as they become due unless such debts are the subject of a bona fide dispute, or become unable to pay its debts generally as they become due, (iii) fail to make a payment of WIFIA Debt Service in accordance with the provisions of Section 8 (*Repayments*) and such failure is not cured within thirty (30) days following notification by the WIFIA Lender of failure to make such payment, (iv) make a general assignment for the benefit of creditors, (v) consent to the institution of, or fail to contest in a timely and appropriate manner, any proceeding or petition with respect to it described in clause (a) of this definition, (vi) commence a voluntary proceeding under any Insolvency Law, or file a voluntary petition seeking liquidation, reorganization, an arrangement with creditors or an order for relief, in each case under any Insolvency Law, (vii) file an answer admitting the material allegations of a petition filed against it in any proceeding referred to in the foregoing subclauses (i) through (v), inclusive, of this clause (b), or (viii) take any action for the purpose of effecting any of the foregoing, including seeking approval or legislative enactment by any Governmental Authority to authorize commencement of a voluntary proceeding under any Insolvency Law; (c) (i) any Person shall commence a process pursuant to which all or a substantial part of the Pledged Collateral may be sold or otherwise disposed of in a public or private sale or disposition pursuant to a foreclosure of the Liens thereon securing the Parity Obligations, or (ii) any Person shall commence a process pursuant to which all or a substantial part of the Pledged Collateral may be sold or otherwise disposed of pursuant to a sale or disposition of such Pledged Collateral in lieu of foreclosure; or (d) any receiver, trustee, liquidator, custodian, sequestrator, conservator or similar official shall transfer, pursuant to directions issued by the holders of the Obligations, funds on deposit in any of the System Accounts upon the occurrence and during the continuation of an Event of Default under this Agreement for application to the prepayment or repayment of any principal amount of the Parity Obligations other than in accordance with the provisions of this Agreement.

"**Base Case Financial Model**" means the financial model or plan, prepared by the Borrower and delivered to the WIFIA Lender as part of the Application, forecasting the capital costs of the Wastewater System (including the Project) and the estimated debt service coverage, rates, revenues, operating expenses and major maintenance requirements of the Wastewater System (as may be applicable) for the Forecast Period and based upon assumptions and methodology provided by the Borrower and acceptable to the WIFIA Lender as of the Effective Date, which model or plan shall have been provided to the WIFIA Lender as a fully functional Microsoft Excel-based financial model or such other format agreed with the WIFIA Lender.

"**Borrower**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Borrower Fiscal Year**" means (a) as of the Effective Date, the Initial Borrower Fiscal Year or (b) such other fiscal year as the Borrower may hereafter adopt after giving thirty (30) days' prior written notice to the WIFIA Lender in accordance with **Part E of Schedule V** (*Reporting Requirements*).

"**Borrower's Authorized Representative**" means any Person who shall be designated as such pursuant to Section 21 (*Borrower's Authorized Representative*).

"**Business Day**" means any day other than a Saturday, a Sunday or a day on which offices of the Federal Government or the State are authorized to be closed or on which commercial banks are authorized or required by law, regulation or executive order to be closed in New York, New York, the Trustee Location or the Project Location.

"**Capitalized Interest Period**" has, if applicable, the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means capitalized interest shall not be applicable with respect to the WIFIA Loan hereunder.

"**City Council**" means the governing body of the Borrower.

"**Closing Certificate**" has the meaning provided in Section 11(a) (*Conditions Precedent to Effectiveness*).

"**Construction Contract**" means, with respect to the Project, any prime contract entered into by the Borrower that involves any construction activity (such as demolition, site preparation, civil works construction, installation, remediation, refurbishment, rehabilitation, or removal and replacement services) for the Project. For the avoidance of doubt, "**Construction Contract**" shall include each Existing Construction Contract and, upon the effectiveness thereof, each Additional Construction Contract.

"**Construction Monitoring Report**" means a report on the status of the Project, substantially in the form of **Exhibit F** (*Form of Construction Monitoring Report*), unless otherwise agreed to be in a different form by the WIFIA Lender.

"**Construction Period**" means the period from the Effective Date through (and including) the end of the Federal Fiscal Year during which the Substantial Completion Date occurs.

"**Construction Period Servicing Fee**" has the meaning ascribed to such term in **Part F of Schedule I** (*WIFIA Loan Specific Terms*).

"**Construction Schedule**" means (a) the initial schedule or schedules on which the construction timetables for the Project are set forth, attached hereto as **Part B of Schedule II** (*Project Details*), and (b) any updates thereto included in the Construction Monitoring Report most recently submitted to the WIFIA Lender in accordance with **Part C of Schedule V** (*Reporting Requirements*).

"**CPI**" means the Consumer Price Index for All Urban Consumers (CPI-U) for the U.S. City Average for All Items, 1982-84=100 (not seasonally adjusted) or its successor, published by the Bureau of Labor Statistics and located at https://www.bls.gov/news.release/cpi.t01.htm.

"**Debt Service Payment Commencement Date**" means the earlier to occur of (a) the first Payment Date immediately following the later of (i) the first Disbursement or (ii) if there is a Capitalized Interest Period, the end of the Capitalized Interest Period, in each case as set forth in the WIFIA Loan Amortization Schedule; or (b) the Payment Date falling closest to, but not later than, the fifth anniversary of the Substantial Completion Date.

"**Default**" means any event or condition that, with the giving of any notice, the passage of time, or both, would be an Event of Default.

"**Default Rate**" has the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*).

"**DEQ Obligation Documents**" means (i) the Borrower's Clean Water State Revolving Fund Loan Agreement No. R80491 with the State, acting by and through its Department of Environmental Quality issued in the principal amount of $799,425, as amended from time to time; (ii) the Borrower's Clean Water State Revolving Fund Loan Agreement No. R80942 with the State, acting by and through its Department of Environmental Quality issued in the principal amount of $20,700,000, as amended from time to time; and (iii) the Borrower's Clean Water State Revolving Fund Loan Agreement No. R80943 with the State, acting by and through its Department of Environmental Quality issued in the principal amount of $7,300,000, as amended from time to time.

"**DEQ Obligations**" means the Borrower's obligations under the DEQ Obligation Documents.

"**Development Default**" means (a) the Borrower abandons work or fails, in the reasonable judgment of the WIFIA Lender, to diligently prosecute the work related to the Project or (b) the Borrower fails to achieve Substantial Completion of the Project by the Development Default Date, unless such failure to achieve Substantial Completion shall occur by reason of an Uncontrollable Force that is not due to the fault or gross negligence of the Borrower (and which the Borrower could not reasonably have avoided or mitigated), in which case the Development Default Date shall be extended by the number of days equal to the duration of such Uncontrollable Force.

"**Development Default Date**" has the meaning ascribed to such term in **Part B of Schedule I** (*WIFIA Loan Specific Terms*).

"**Disbursement**" means a disbursement of WIFIA Loan proceeds, subject to and in accordance with this Agreement.

"**Dollars**" and "**$**" means the lawful currency of the U.S.

"**Effective Date**" means the date of this Agreement, as specified in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Eligible Project Costs**" means amounts in the Project Budget approved by the WIFIA Lender, which are paid by or for the account of the Borrower in connection with the Project (including, as applicable, Project expenditures incurred prior to the receipt of WIFIA credit assistance), which shall arise from the following:

(a) development-phase activities, including planning, feasibility analysis (including any related analysis necessary to carry out an eligible project), revenue forecasting, environmental review, permitting, preliminary engineering and design work and other preconstruction activities;

(b) construction, reconstruction, rehabilitation, and replacement activities;

(c) the acquisition of real property or an interest in real property (including water rights, land relating to the Project and improvements to land), environmental mitigation (including acquisitions pursuant to 33 U.S.C. §3905(8)), construction contingencies, and acquisition of equipment; or

(d) capitalized interest (with respect to Obligations other than the WIFIA Loan) necessary to meet market requirements, reasonably required reserve funds, capital issuance expenses, and other carrying costs during construction;

provided, that Eligible Project Costs must be consistent with all other applicable federal law, including the Act.

"**Eligible Project Costs Documentation**" means all supporting documentation with respect to the Eligible Project Costs, including copies of invoices and records evidencing incurred or previously paid Eligible Project Costs, which documentation should contain sufficient detail satisfactory to the WIFIA Lender (e.g. if the Borrower intends to utilize WIFIA Loan proceeds to make construction progress payments for Eligible Project Costs, the documentation should demonstrate that such progress payments are commensurate with the cost of the work that has been completed).

"**EMMA**" means the Electronic Municipal Market Access system as described in 1934 Act Release No. 59062 and maintained by the Municipal Securities Rulemaking Board established pursuant to Section 15B(b)1 of the Securities Exchange Act of 1934, as amended, and its successors.

"**EPA**" has the meaning provided in the preamble hereto.

"**Event of Default**" has the meaning provided in Section 17(a) (*Events of Default and Remedies*).

"**Event of Loss**" means any event or series of events that causes any portion of the Wastewater System to be damaged, destroyed or rendered unfit for normal use for any reason whatsoever, including through a casualty, a failure of title, or any loss of such property through eminent domain.

"**Existing Construction Contract**" means each Construction Contract of the Borrower in effect as of the Effective Date as set forth in **Part C of Schedule II** (*Project Details*).

"**Existing Indebtedness**" means Obligations of the Borrower that have been issued or incurred prior to the Effective Date, as listed and described in **Part A of Schedule III** (*Borrower Disclosures*).

"**Federal Fiscal Year**" means the fiscal year of the Federal Government, which is the twelve (12) month period that ends on September 30 of the specified calendar year and begins on October 1 of the preceding calendar year.

"**Federal Government**" means the U.S. and its departments and agencies.

"**FEIN**" means a Federal Employer Identification Number.

"**Final Disbursement Date**" means the earliest of (a) the date on which the WIFIA Loan has been disbursed in full; (b) the last anticipated date of disbursement set forth in the then-current WIFIA Loan Disbursement Schedule; (c) the date as of which the Borrower has certified to the WIFIA Lender that it will not request any further disbursements under the WIFIA Loan; (d) the date on which the WIFIA Lender terminates its obligations relating to disbursements of any undisbursed amounts of the WIFIA Loan in accordance with Section 17 (*Events of Default and Remedies*); and (e) the date that is one (1) year after the Substantial Completion Date.

"**Final Maturity Date**" has the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*).

"**Financial Statements**" has the meaning provided in Section 12(q) (*Financial Statements*).

"**Flow of Funds**" has the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Forecast Period**" means, as of any date, the time period from and including the then-current Borrower Fiscal Year until the later ending date of either (a) the five (5) immediately succeeding Borrower Fiscal Years or (b) the end of the Borrower Fiscal Year in which the Borrower's then-currently effective capital improvement plan for the Wastewater System concludes.

"**GAAP**" means generally accepted accounting principles for U.S. state and local governments, as established by the Government Accounting Standards Board (or any successor entity with responsibility for establishing accounting rules for governmental entities), in effect from time to time in the U.S.

"**Governmental Approvals**" means all authorizations, consents, approvals, waivers, exceptions, variances, filings, registrations, permits, orders, licenses, exemptions and declarations of or with any Governmental Authority.

"**Governmental Authority**" means any federal, state, provincial, county, city, town, village, municipal or other government or governmental department, commission, council, court,

board, bureau, agency, authority or instrumentality (whether executive, legislative, judicial, administrative or regulatory), of or within the U.S. or its territories or possessions, including the State and its counties and municipalities, and their respective courts, agencies, instrumentalities and regulatory bodies, or any entity that acts "on behalf of" any of the foregoing, whether as an agency or authority of such body.

"**Gross Revenues**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Indemnitee**" has the meaning provided in Section 32 (*Indemnification*).

"**Initial Borrower Fiscal Year**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Initial Construction Period Servicing Fee**" has the meaning ascribed to such term in **Part F of Schedule I** (*WIFIA Loan Specific Terms*).

"**Insolvency Laws**" means the U.S. Bankruptcy Code, 11 U.S.C. § 101 *et seq*., as from time to time amended and in effect, and any state bankruptcy, insolvency, receivership, conservatorship or similar law now or hereafter in effect.

"**Interest Only Period**" has, if applicable, the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means no interest only period shall be applicable with respect to the WIFIA Loan hereunder.

"**Interest Payment Date**" has the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*).

"**Interim Financing**" means interim bond anticipation notes, commercial paper or other short-term temporary financing, in each case with a maturity not later than five (5) years following the issuance or incurrence thereof, the proceeds of which are applied to pay Eligible Project Costs.

"**Investment Grade Rating**" means a rating of 'BBB-', 'Baa3', 'bbb-', or 'BBB (low)', or higher, from a Nationally Recognized Rating Agency.

"**Legal Entity**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Lien**" means any mortgage, pledge, hypothecation, assignment, mandatory deposit arrangement, encumbrance, attachment, lien (statutory or other), charge or other security interest, or preference, priority or other security agreement or preferential arrangement of any kind or nature whatsoever, including any sale-leaseback arrangement, any conditional sale or other title retention agreement, any financing lease having substantially the same effect as any of the foregoing, and the filing of any financing statement or similar instrument under the UCC or any other applicable law.

"**Loss Proceeds**" means any proceeds of builders' risk or casualty insurance (other than any proceeds from any policy of business interruption insurance insuring against loss of revenues

upon the occurrence of certain casualties or events covered by such policy of insurance) or proceeds of eminent domain proceedings resulting from any Event of Loss.

"**Material Adverse Effect**" means a material adverse effect on (a) the Wastewater System, the Project, the Gross Revenues or the Net Revenues, (b) the business, operations, properties, condition (financial or otherwise) or prospects of the Borrower, (c) the legality, validity or enforceability of any material provision of any WIFIA Loan Document, (d) the ability of the Borrower to enter into, perform or comply with any of its material obligations under any WIFIA Loan Document, (e) the validity, enforceability or priority of the Liens provided under the WIFIA Loan Documents on the Pledged Collateral or (f) the WIFIA Lender's rights or remedies available under any WIFIA Loan Document.

"**Maximum Principal Amount**" has the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*).

"**Nationally Recognized Rating Agency**" means any nationally recognized statistical rating organization registered with, and identified as such by, the Securities and Exchange Commission, pursuant to 15 U.S.C. § 78o-7.

"**NEPA**" means the National Environmental Policy Act of 1969, as amended, and any successor statute of similar import, and regulations thereunder, in each case as in effect from time to time.

"**NEPA Determination**" has the meaning ascribed to such term in **Part B of Schedule I** (*WIFIA Loan Specific Terms*).

"**Net Revenues**" means the Gross Revenues less the Operating Expenses.

"**Obligations**" means debt of the Borrower that is secured by a pledge and lien on all or a portion of the Net Revenues, including the Parity Obligations and Subordinate Obligations.

"**Operating Expenses**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Operating Period Servicing Fee**" has the meaning ascribed to such term in **Part F of Schedule I** (*WIFIA Loan Specific Terms*).

"**Organizational Documents**" means: (a) the constitutional and statutory provisions that are the basis for the existence and authority of the Borrower, including any enabling statutes, ordinances or public charters and any other organic laws establishing the Borrower and (b) the resolutions, bylaws, or other organizational documents (including any amendments, modifications or supplements thereto) of or adopted by the Borrower by which the Borrower, its powers, operations or procedures or its securities, bonds, notes or other obligations are governed or from which such powers are derived.

"**ORS**" means the Oregon Revised Statutes.

"**Other Financing Documents**" means any agreement, instrument, or document (excluding the WIFIA Loan Documents) entered into between the Borrower and a holder of Obligations providing for the issuance of Obligations secured by a pledge and lien on all or a portion of the Net Revenues. The Other Financing Documents include the Parity Obligation Documents.

"**Outstanding**" means (a) with respect to Parity Obligations other than the WIFIA Loan and the DEQ Obligations, Obligations that have not been cancelled or legally defeased or discharged within the meaning of the applicable Parity Obligation Documents, (b) with respect to the WIFIA Loan, the (i) entire amount available to be drawn under this Agreement (including amounts drawn and amounts that remain available to be drawn), less (ii) any amount that has been irrevocably determined will not be drawn under this Agreement, less (iii) the aggregate principal amount of the WIFIA Loan Balance that has been repaid or prepaid, and (c) with respect to the DEQ Obligations, the (i) maximum amount available to be drawn under the applicable DEQ Obligation Documents (including amounts drawn and amounts that remain available to be drawn), less (ii) any amount that has been irrevocably determined will not be drawn under the applicable DEQ Obligation Documents, less (iii) the aggregate principal amount of such DEQ Obligation that has been repaid or prepaid.

"**Parity Obligation Documents**" any agreement, instrument, or document entered into between the Borrower and a holder of Parity Obligations providing for the issuance or incurrence of Parity Obligations secured by a pledge and lien on all or a portion of the Net Revenues that ranks *pari passu* in right of payment and right of security with the WIFIA Loan. The Parity Obligation Documents include the DEQ Obligation Documents and the WIFIA Loan Documents.

"**Parity Obligations**" means the DEQ Obligations, the WIFIA Loan (as evidenced by the WIFIA Bond), and any Additional Parity Obligations.

"**Patriot Act**" means the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act of 2001, as amended, and all regulations promulgated thereunder.

"**Payment Date**" means each Interest Payment Date and each Principal Payment Date.

"**Payment Default**" has the meaning provided in Section 17(a)(i) (*Payment Default*).

"**Permitted Debt**" means:

(a) Existing Indebtedness;

(b) the WIFIA Loan (as evidenced by the WIFIA Bond);

(c) Additional Parity Obligations that satisfy the requirements of Section 15(a) (*Indebtedness*);

(d) Subordinate Obligations that satisfy the requirements of Section 15(a) (*Indebtedness*); and

(e) indebtedness incurred in respect of hedging transactions permitted under the WIFIA Loan Documents.

"**Permitted Investments**" means any investment that the Borrower is permitted to make under applicable State law and the Borrower's investment policies.

"**Permitted Liens**" means:

(a) Liens imposed pursuant to the WIFIA Loan Documents;

(b) Liens imposed in respect of Permitted Debt;

(c) Liens imposed by law, including Liens for taxes that are not yet due or are being contested in compliance with Section 14(j) (*Material Obligations*);

(d) carriers', warehousemen's, mechanics', materialmen's, repairmen's and other like Liens imposed by law, arising in the ordinary course of business and securing obligations that are not overdue by more than thirty (30) days or are being contested in compliance with Section 14(j) (*Material Obligations*);

(e) pledges and deposits made in the ordinary course of business in compliance with workers' compensation, unemployment insurance, and other social security laws or regulations;

(f) deposits to secure the performance of trade contracts, leases, statutory obligations, surety and appeal bonds, performance bonds and other obligations of a like nature, in each case in the ordinary course of business;

(g) judgment Liens in respect of judgments that do not constitute an Event of Default under Section 17(a)(viii) (*Material Adverse Judgment*); and

(h) easements, zoning restrictions, rights-of-way and similar encumbrances on real property imposed by law or arising in the ordinary course of business that, in any case, do not secure any monetary obligations and do not materially detract from the value of the affected property or interfere with the ordinary conduct of business of the Borrower.

"**Person**" means and includes an individual, a general or limited partnership, a joint venture, a corporation, a limited liability company, a trust, an unincorporated organization and any Governmental Authority, including in each case such Person's successors and permitted assigns.

"**Pledged Collateral**" has the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Principal Payment Date**" has the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*).

"**Project**" has the meaning ascribed to such term in **Part B of Schedule I** (*WIFIA Loan Specific Terms*).

"**Project Budget**" means the budget for the Project attached to this Agreement as **Part A of Schedule II** (*Project Details*) showing a summary of Total Project Costs with a breakdown of all Eligible Project Costs and the estimated sources and uses of funds for the Project.

"**Project Location**" has the meaning ascribed to such term in **Part B of Schedule I** (*WIFIA Loan Specific Terms*).

"**Projected Substantial Completion Date**" has the meaning ascribed to such term in **Part B of Schedule I** (*WIFIA Loan Specific Terms*).

"**Public Benefits Report**" means the report, in the form attached hereto as **Exhibit C** (*Form of Public Benefits Report*).

"**Rate Covenant**" has the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Rate Stabilization Account**" has the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Related Documents**" means the WIFIA Loan Documents and the Other Financing Documents.

"**Requisition**" means the request for Disbursement in the form attached hereto as **Exhibit D** (*Form of Requisition*).

"**SAM**" means the federal System for Award Management (www.SAM.gov) (or any successor system or registry).

"**Sanctions Laws**" means collectively, any applicable anti-drug trafficking, anti-terrorism, anti-money laundering, anti-bribery, or anti-corruption laws or regulations, as applicable, including those contained in the Bank Secrecy Act of 1970 (as amended) and the U.S. Patriot Act.

"**Separate Utility System**" means any utility property which is declared by the City Council to constitute a system which is distinct from the Wastewater System.

"**Servicer**" means such entity or entities as the WIFIA Lender shall designate from time to time to perform, or assist the WIFIA Lender in performing, certain duties hereunder.

"**Servicing Fee**" means the Servicing Set-Up Fee and any Construction Period Servicing Fee or Operating Period Servicing Fee.

"**Servicing Set-Up Fee**" has the meaning ascribed to such term in **Part F of Schedule I** (*WIFIA Loan Specific Terms*).

"**State**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**Subordinate Obligations**" means obligations having a lien on the Net Revenues that is subordinate to the lien of the Parity Obligations permitted under Section 15(a) (*Indebtedness*), which Subordinate Obligations are issued or incurred after the Effective Date. Restrictions on the issuance or incurrence of Subordinate Obligations are described in Section 15(a) (*Indebtedness*).

"**Subordinate Obligations Account**" means the Subordinate Obligations Account of the Wastewater Fund which is described in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Substantial Completion**" means, with respect to the Project, the stage at which the Project is able to perform the functions for which the Project is designed.

"**Substantial Completion Date**" means the date on which the Borrower certifies to the WIFIA Lender, with evidence satisfactory to the WIFIA Lender and notice to the WIFIA Lender in accordance with **Part E of Schedule V** (*Reporting Requirements*), that Substantial Completion has occurred.

"**System Accounts**" has the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Total Project Costs**" means (a) the costs paid or incurred or to be paid or incurred by the Borrower in connection with or incidental to the acquisition, design, construction and equipping of the Project, including legal, administrative, engineering, planning, design, insurance and financing (including costs of issuance); (b) amounts, if any, required by the WIFIA Loan Documents to be paid into any fund or account upon the incurrence of the WIFIA Loan or any other Obligations, in each case in respect of the Project; (c) payments when due (whether at the maturity of principal, the due date of interest, or upon optional or mandatory prepayment) in respect of any indebtedness of the Borrower (other than the WIFIA Loan), in each case in connection with the acquisition, design, construction and equipping of the Project; and (d) costs of equipment and supplies and initial working capital and reserves required by the Borrower for the commencement of operation of the Project, including general administrative expenses and overhead of the Borrower.

"**Trustee**" has, if applicable, the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means a trustee shall not be applicable with respect to the WIFIA Loan hereunder.

"**Trustee Location**" has, if applicable, the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means a trustee location shall not be applicable with respect to the WIFIA Loan hereunder.

"**Uncontrollable Force**" means any cause beyond the control of the Borrower, including: (a) a hurricane, tornado, flood or similar occurrence, landslide, earthquake, fire or other casualty, strike or labor disturbance, freight embargo, act of a public enemy, explosion, war, blockade, terrorist act, insurrection, riot, general arrest or restraint of government and people, civil disturbance or similar occurrence, sabotage, pandemic, or act of God (provided, that the Borrower shall not be required to settle any strike or labor disturbance in which it may be involved) or (b) the order or judgment of any federal, state or local court, administrative agency or governmental officer or body, if it is not also the result of willful or negligent action or a lack of reasonable

diligence of the Borrower and the Borrower does not control the administrative agency or governmental officer or body; provided, that the diligent contest in good faith of any such order or judgment shall not constitute or be construed as a willful or negligent action or a lack of reasonable diligence of the Borrower.

"**Unique Entity Identifier**" or "**UEI**" means, with respect to any Person, the unique entity identifier issued by the Federal Government (including through SAM.gov) for such Person.

"**Uniform Commercial Code**" or "**UCC**" means the Uniform Commercial Code, as in effect from time to time in the State.

"**Updated Financial Model/Plan**" means (a) an updated Base Case Financial Model or (b) a financial plan in a format agreed with the WIFIA Lender, in each case reflecting the then-current and projected conditions for the Forecast Period, in accordance with **Part A of Schedule V** (*Reporting Requirements*).

"**U.S.**" means the United States of America.

"**Wastewater Fund**" has the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*).

"**Wastewater System**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**WIFIA**" has the meaning provided in the recitals hereto.

"**WIFIA Bond**" has, if applicable, the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means a bond as evidence of the Borrower's Obligation shall not be applicable with respect to the WIFIA Loan hereunder.

"**WIFIA CUSIP Number**" has the meaning ascribed to such term in **Part A of Schedule I** (*WIFIA Loan Specific Terms*).

"**WIFIA Debt Service**" means with respect to any Payment Date occurring on or after the Debt Service Payment Commencement Date, the principal portion of the WIFIA Loan Balance and any interest payable thereon (including interest accruing after the date of any filing by the Borrower of any petition in bankruptcy or the commencement of any bankruptcy, insolvency or similar proceeding with respect to the Borrower), in each case, (a) as set forth on the WIFIA Loan Amortization Schedule and (b) due and payable on such Payment Date in accordance with the provisions of Section 8(a) (*Payment of WIFIA Debt Service*).

"**WIFIA Debt Service Account**" has, if applicable, the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means a separate debt service account designated for the WIFIA Lender shall not be applicable with respect to the WIFIA Loan hereunder.

"**WIFIA Debt Service Reserve Account**" has, if applicable, the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means a separate debt service reserve account designated for the WIFIA Lender shall not be applicable with respect to the WIFIA Loan hereunder.

"**WIFIA Debt Service Reserve Requirement**" has, if applicable, the meaning ascribed to such term in **Part D of Schedule I** (*WIFIA Loan Specific Terms*), or if designated as "Not Applicable" in **Schedule I**, means a separate debt service reserve requirement shall not be applicable with respect to the WIFIA Loan hereunder.

"**WIFIA Interest Rate**" has the meaning ascribed to such term in **Part C of Schedule I** (*WIFIA Loan Specific Terms*).

"**WIFIA Lender**" has the meaning provided in the preamble hereto.

"**WIFIA Lender's Authorized Representative**" means the Administrator and any other Person who shall be designated as such pursuant to Section 22 (*WIFIA Lender's Authorized Representative*).

"**WIFIA Loan**" means the secured loan made by the WIFIA Lender to the Borrower on the terms and conditions set forth herein, pursuant to the Act, in a principal amount not to exceed the Maximum Principal Amount, to be used in respect of Eligible Project Costs.

"**WIFIA Loan Amortization Schedule**" means the loan amortization schedule reflected in **Schedule VI** (*WIFIA Loan Amortization Schedule*), as amended from time to time in accordance with Section 8(c) (*Adjustments to WIFIA Loan Amortization Schedule*).

"**WIFIA Loan Balance**" means (a) the aggregate principal amount of the WIFIA Loan disbursed by the WIFIA Lender to the Borrower hereunder, *plus* (b) if applicable, capitalized interest added to the principal balance of the WIFIA Loan pursuant to Section 8(a)(iii) (*Payments of WIFIA Debt Service*), *minus* (c) the aggregate principal amount of the WIFIA Loan repaid or prepaid by the Borrower, as reflected from time to time in the WIFIA Loan Amortization Schedule in accordance with Section 8(c) (*Adjustments to WIFIA Loan Amortization Schedule*).

"**WIFIA Loan Disbursement Schedule**" means the disbursement schedule set forth in **Schedule VI** (*WIFIA Loan Amortization Schedule*), reflecting the anticipated disbursement of proceeds of the WIFIA Loan, as such schedule may be amended from time to time pursuant to Section 4(b) (*Disbursement Conditions*).

"**WIFIA Loan Documents**" means this Agreement, the WIFIA Bond, the Authorizing Ordinance and the Authorizing Resolution.

"**WIFIA Term Sheet**" has the meaning ascribed to such term in **Part E of Schedule I** (*WIFIA Loan Specific Terms*).

Section 2. Interpretation. The rules of interpretation set forth below in this Section 2 shall apply to this Agreement, except as otherwise expressly provided herein.

(a) Unless the context shall otherwise require, the words "hereto," "herein," "hereof" and other words of similar import refer to this Agreement as a whole.

(b) Words of the masculine gender shall be deemed and construed to include correlative words of the feminine and neuter genders and vice versa.

(c) Words importing the singular number shall include the plural number and vice versa unless the context shall otherwise require.

(d) The words "include," "includes" and "including" shall be deemed to be followed by the phrase "without limitation."

(e) Whenever the Borrower's knowledge is implicated in this Agreement or the phrase "to the Borrower's knowledge" or a similar phrase is used in this Agreement, the Borrower's knowledge or such phrase(s) shall be interpreted to mean to the best of the Borrower's knowledge after reasonable and diligent inquiry.

(f) Unless the context shall otherwise require, references to preambles, recitals, sections, subsections, clauses, schedules, exhibits, appendices and provisions are to the applicable preambles, recitals, sections, subsections, clauses, schedules, exhibits, appendices and provisions of this Agreement.

(g) The recitals, schedules and exhibits to this Agreement, and the appendices and schedules to such exhibits, are hereby incorporated by reference and made an integral part of this Agreement.

(h) The headings or titles of this Agreement and its sections, schedules or exhibits, as well as any table of contents, are for convenience of reference only and shall not define or limit its provisions.

(i) Unless the context shall otherwise require, all references to any resolution, contract, agreement, lease or other document shall be deemed to include any amendments or supplements to, or modifications or restatements or replacements of, such documents that are approved from time to time in accordance with the terms thereof and hereof.

(j) Every request, order, demand, application, appointment, notice, statement, certificate, consent or similar communication or action hereunder by any party shall, unless otherwise specifically provided, be delivered in writing in accordance with Section 31 (*Notices*) and signed by a duly authorized representative of such party.

(k) References to "disbursements of WIFIA Loan proceeds" or similar phrasing shall be construed as meaning the same thing as "paying the purchase price of the WIFIA Bond".

(l) Whenever this Agreement requires a change in principal amount, interest rate or amortization schedule of the WIFIA Loan, it is intended that such change be reflected in the WIFIA Bond. Whenever there is a prepayment of the WIFIA Loan, it is intended that such prepayment be implemented through a prepayment of the WIFIA Bond.

(m) Whenever this Agreement sets forth a time period for a number of days by when a deliverable must be provided or an action must be taken, such time period shall be computed on the basis of a three hundred sixty (360) day year of twelve (12) thirty (30) day months.

## ARTICLE II
## THE WIFIA LOAN

Section 3. WIFIA Loan Amount. The principal amount of the WIFIA Loan shall not exceed the Maximum Principal Amount.

Section 4. Disbursement Conditions.

(a) WIFIA Loan proceeds shall be disbursed solely in respect of Eligible Project Costs paid or incurred and approved for payment by or on behalf of the Borrower in connection with the Project, including, for the avoidance of doubt, Eligible Project Costs that were initially funded with Interim Financing proceeds. Each Disbursement of the WIFIA Loan shall be made pursuant to the procedures of **Schedule IV** (*Requisition Procedures*) and subject to the requirements of this Section 4 and the conditions set forth in Section 11(b) (*Conditions Precedent to Disbursements*); provided, that no Disbursements shall be made after the Final Disbursement Date.

(b) Subject to this Section 4, any scheduled Disbursement (as reflected in the WIFIA Loan Disbursement Schedule) that remains undrawn as of its scheduled date shall automatically be available for the next scheduled Disbursement date, up to the Final Disbursement Date, with the effect of automatically updating the WIFIA Loan Disbursement Schedule (and the WIFIA Loan Amortization Schedule) without need for the WIFIA Lender's approval. The Borrower may also amend the WIFIA Loan Disbursement Schedule by submitting a revised version thereof to the WIFIA Lender no later than thirty (30) days prior to the proposed effective date of such amendment, together with a detailed explanation of the reasons for such revisions. Such revised WIFIA Loan Disbursement Schedule shall become effective upon the WIFIA Lender's approval thereof, which approval shall be deemed granted if the WIFIA Lender has not objected within thirty (30) days from receipt of the revised schedule, and which approval shall have the effect of updating the WIFIA Loan Amortization Schedule to reflect the updated WIFIA Loan Disbursement Schedule. Notwithstanding the foregoing, the date of the first Disbursement shall not be earlier than the initial date of Disbursement set out in the WIFIA Loan Amortization Schedule as of the Effective Date.

Section 5. Term. The term of the WIFIA Loan shall extend from the Effective Date to the Final Maturity Date or to such earlier date as all amounts due or to become due to the WIFIA Lender hereunder have been irrevocably paid in full in immediately available funds.

Section 6. Interest Rate. The Borrower shall pay interest on the WIFIA Loan Balance at the WIFIA Interest Rate; provided, that, upon the occurrence of an Event of Default, the Borrower shall pay interest on the WIFIA Loan Balance at the Default Rate, (a) in the case of any Payment Default, from (and including) its due date to (but excluding) the date of actual payment of the overdue amount of principal of the WIFIA Loan and accrued interest thereon and (b) in the case of any other Event of Default, from (and including) the date of such occurrence to (but

excluding) the earlier of the date on which (i) such Event of Default has been cured (if applicable) in accordance with the terms of this Agreement or waived by the WIFIA Lender and (ii) the WIFIA Loan Balance has been irrevocably paid in full in immediately available funds. Interest shall (x) accrue on the WIFIA Loan commencing on the date of the first disbursement of the WIFIA Loan, (y) be payable commencing on the Debt Service Payment Commencement Date and (z) be computed on the WIFIA Loan Balance on the basis of a three hundred sixty (360) day year of twelve (12) thirty (30) day months.

Section 7. Security and Priority; Flow of Funds.

(a) As security for the WIFIA Loan, and concurrently with the issuance and delivery of this Agreement, the Borrower hereby pledges, assigns and grants to the WIFIA Lender for its benefit, Liens on the Pledged Collateral to the extent and in the manner and priority set forth herein and in the other WIFIA Loan Documents. The Borrower hereby pledges the Net Revenues, and funds in the WIFIA Debt Service Account and the WIFIA Debt Service Reserve Account, to secure the WIFIA Loan for the benefit of the WIFIA Lender. Pursuant to ORS 287A, this pledge of the Net Revenues hereby made by the Borrower shall be valid and binding from the Effective Date. The Net Revenues so pledged and hereafter received by the Borrower shall immediately be subject to the lien of such pledge without any physical delivery or further act. The lien on the Net Revenues shall be superior to all other claims and liens except liens and claims for the payment of Operating Expenses. The Borrower covenants and agrees to take such action as is necessary from time to time to perfect or otherwise preserve the priority of the pledge. The Lien on the Net Revenues to secure the WIFIA Loan for the benefit of the WIFIA Lender is and shall be (i) on a parity in right of payment and right of security to the Lien on the Net Revenues in favor of all other Parity Obligations (including, without limitation, the DEQ Obligations) and (ii) senior in right of payment and right of security to the Lien on the Pledged Collateral in favor of any Subordinate Obligations. As evidence of the Borrower's obligation to repay the WIFIA Loan, the Borrower shall issue and deliver to the WIFIA Lender, as the registered owner, on or prior to the Effective Date, the WIFIA Bond.

(b) Amounts deposited in the Wastewater Fund shall be applied in the order of priority described in, and in accordance with, the Flow of Funds.

Section 8. Repayments.

(a) Payment of WIFIA Debt Service.

(i) No WIFIA Debt Service shall be due or payable prior to the Debt Service Payment Commencement Date. The Borrower shall pay (A) WIFIA Debt Service in the amounts and manner and on the Payment Dates as set forth in the WIFIA Loan Amortization Schedule, as the same may be revised pursuant to Section 8(c) (*Adjustments to WIFIA Loan Amortization Schedule*) and (B) payments of any other amounts on each other date on which payment thereof is required to be made hereunder; provided, that, in either case if any such date is not a Business Day, payment shall be made on the next

Business Day following such date. WIFIA Loan proceeds borrowed and repaid may not be re-borrowed.

(ii) Notwithstanding anything herein to the contrary, the WIFIA Loan Balance and any accrued interest thereon shall be due and payable in full on the Final Maturity Date.

(iii) If a Capitalized Interest Period is applicable as set forth in **Part C of Schedule I** (*WIFIA Loan Specific Terms*), during the Capitalized Interest Period, no payment of principal of or interest on the WIFIA Loan will be required to be made. On each Interest Payment Date occurring during the Capitalized Interest Period (including the day immediately following the end of the Capitalized Interest Period), interest accrued and not paid on the WIFIA Loan during each six (6) month period ending immediately prior to such date (or such shorter period if the Capitalized Interest Period ends on a day other than one (1) day prior to an Interest Payment Date) shall be capitalized and added to the WIFIA Loan Balance, as set forth in the WIFIA Loan Amortization Schedule. Within thirty (30) days after the end of the Capitalized Interest Period, the WIFIA Lender shall give written notice to the Borrower stating the WIFIA Loan Balance as of the close of business on the last day of the Capitalized Interest Period, which statement thereof shall be deemed conclusive absent manifest error; provided, however, that no failure to give or delay in giving such notice shall affect any of the obligations of the Borrower hereunder or under any of the other WIFIA Loan Documents. Notwithstanding the foregoing, the Capitalized Interest Period shall end immediately upon written notification to the Borrower by the WIFIA Lender that an Event of Default has occurred and that the WIFIA Lender has elected to end the Capitalized Interest Period, in which case interest shall no longer be capitalized, payments of interest shall be due and payable beginning on the next Interest Payment Date and payments of principal shall be due and payable beginning on the next Principal Payment Date, in each case in accordance with the terms hereof.

(iv) If an Interest Only Period is applicable as set forth in **Part C of Schedule I** (*WIFIA Loan Specific Terms*), during the Interest Only Period, the WIFIA Debt Service payable by the Borrower shall consist of one hundred percent (100%) of the amount of interest then due and payable on the WIFIA Loan Balance, and no payment of the principal of the WIFIA Loan will be due and payable during the Interest Only Period.

(v) The WIFIA Loan shall not be subject to defeasance and no amounts in respect of the WIFIA Loan shall be considered or deemed to have been paid until the WIFIA Lender shall have received irrevocable payment in immediately available funds in accordance with the requirements for payment set forth in this Agreement.

(b) Manner of Payment. Payments under this Agreement (and the WIFIA Bond, which payments shall not be duplicative) shall be made in Dollars and in immediately available funds (without counterclaim, offset or deduction) in accordance with the payment instructions provided by the WIFIA Lender prior to the relevant payment, as may be modified in writing from time to time by the WIFIA Lender; provided, that the failure to provide updated payment instructions shall not affect in any manner the Borrower's obligations hereunder or under any other WIFIA Loan Document.

(c) Adjustments to WIFIA Loan Amortization Schedule.

(i) The WIFIA Lender may, from time to time, modify the WIFIA Loan Amortization Schedule included in **Schedule VI** (*WIFIA Loan Amortization Schedule*) to reflect (A) any change to the WIFIA Loan Balance, (B) any change to the date and amount of any principal or interest due and payable or to become due and payable by the Borrower hereunder in accordance with this Agreement, (C) any mathematical corrections as the WIFIA Lender may determine are necessary, and (D) with the consent of the Borrower (not to be unreasonably withheld), such other information as the WIFIA Lender may determine is necessary for administering the WIFIA Loan and this Agreement. Any calculations described above shall be rounded up to the nearest whole cent. Any adjustments or revisions to the WIFIA Loan Amortization Schedule as a result of a decrease in the WIFIA Loan Balance shall be applied to reduce future payments due on the WIFIA Loan in inverse order of maturity, other than prepayments which shall be applied in accordance with Section 9(b) (*General Prepayment Instructions*). If the WIFIA Loan Amortization Schedule is modified pursuant to this Section 8(c), the WIFIA Lender shall provide the Borrower with a copy of such revised WIFIA Loan Amortization Schedule, but no failure to provide or delay in providing the Borrower with such copy shall affect any of the obligations of the Borrower under this Agreement or the other WIFIA Loan Documents. The WIFIA Lender may also, from time to time or when so requested by the Borrower, advise the Borrower by written notice of the amount of the WIFIA Loan Balance as of the date of such notice. Absent manifest error, the WIFIA Lender's determination of the WIFIA Loan Balance and all matters as set forth on the WIFIA Loan Amortization Schedule shall be deemed conclusive evidence thereof; provided, that neither the failure to make any such determination, modification, or recordation nor any error in such determination, modification, or recordation shall affect in any manner the Borrower's obligations hereunder or under any other WIFIA Loan Document.

(ii) The Borrower shall have the right to propose adjustments to the WIFIA Loan Amortization Schedule with respect to the WIFIA Loan exercisable once on or prior to the date that is one hundred and twenty (120) days preceding the first Principal Payment Date, such adjustments to be submitted by the Borrower to the WIFIA Lender in the form of an updated **Schedule VI** (*WIFIA Loan Amortization Schedule*), together with (i) an explanation setting out the reason for such proposed adjustments (such as material unforeseen changes to the Project schedule, costs, or the Borrower's funding strategy) and (ii) an updated rating affirmation or current public rating from a NRSRO on the WIFIA Loan (or other parity obligations, as the WIFIA Lender may agree) demonstrating the Borrower's continued creditworthiness; provided that (x) the form of and any adjustment to the WIFIA Loan Amortization Schedule, together with the Borrower's explanation and the rating affirmation, shall be acceptable to the WIFIA Lender, (y) the Weighted Average Life of the WIFIA Loan shall not exceed [__] years measured as of the initial disbursement date of the WIFIA Loan and (z) the WIFIA Loan Amortization Schedule shall comply with all applicable requirements under this Agreement and law. Such revised WIFIA Loan Amortization Schedule shall become effective upon the approval by the WIFIA Lender in its sole discretion.

Section 9. Prepayment.

(a) Optional Prepayments. The Borrower may prepay the WIFIA Loan, without penalty or premium, (i) in full on any date on or after the Final Disbursement Date or (ii) in part on any Payment Date on or after the Final Disbursement Date (and, if in part, the amounts thereof to be prepaid shall be determined by the Borrower; provided, that such prepayment shall be in principal amounts of $500,000 or any integral multiple of $1.00 in excess thereof), in each case from time to time but not more than once annually in accordance with 33 U.S.C. § 3908(c)(4)(A). The Borrower may make such prepayment by paying to the WIFIA Lender such principal amount of the WIFIA Loan to be prepaid, together with the unpaid interest accrued on the amount of principal so prepaid to the date of such prepayment and all fees and expenses then due and payable to the WIFIA Lender. Each prepayment of the WIFIA Loan pursuant to this Section 9(a) shall be made on such date and in such principal amount as shall be specified by the Borrower in a written notice, signed by the Borrower's Authorized Representative and delivered to the WIFIA Lender not less than thirty (30) days prior to the requested date of prepayment, unless otherwise agreed by the WIFIA Lender. At any time between delivery of such written notice and the applicable optional prepayment, the Borrower may, without penalty or premium, rescind its announced optional prepayment by further written notice to the WIFIA Lender. Anything in this Section 9(a) to the contrary notwithstanding, the failure by the Borrower to make any optional prepayment shall not constitute a breach or default under this Agreement.

(b) General Prepayment Instructions. Upon the WIFIA Lender's receipt of confirmation that payment in full in immediately available funds of the entire WIFIA Loan Balance and any unpaid interest, fees and expenses with respect thereto has occurred as a result of a prepayment, the WIFIA Lender shall surrender the WIFIA Bond to the Borrower or its authorized representative, by mail in accordance with Section 31 (*Notices*) or as otherwise agreed between the parties hereto. If the Borrower prepays only part of the unpaid balance of principal of the WIFIA Loan, the WIFIA Lender may make a notation on the WIFIA Loan Amortization Schedule indicating the amount of principal of and interest on the WIFIA Loan then being prepaid. Absent manifest error, the WIFIA Lender's determination of such matters as set forth on an updated WIFIA Loan Amortization Schedule shall be conclusive evidence thereof; provided, that neither the failure to make any such recordation nor any error in such recordation shall affect in any manner the Borrower's obligations hereunder or under any other WIFIA Loan Document. All partial prepayments of principal shall be applied to reduce the WIFIA Loan Balance such that the remaining scheduled principal payments for the WIFIA Loan set out in the WIFIA Loan Amortization Schedule are reduced substantially *pro rata*. If such funds have not been so paid on the prepayment date, such principal amount of the WIFIA Loan shall continue to bear interest until payment thereof at the rate provided for in Section 6 (*Interest Rate*).

(c) [Reserved].

Section 10. Fees and Expenses.

(a) Fees. The Borrower shall pay to the WIFIA Lender:

(i) the Servicing Set-Up Fee, which shall be due and payable within thirty (30) days after receipt by the Borrower of an invoice from the WIFIA Lender with respect thereto (or, if earlier, the date of the first Disbursement of the WIFIA Loan);

(ii) the Construction Period Servicing Fee, which shall accrue on the first Business Day of the then-current Federal Fiscal Year and shall be due and payable on or prior to each November 15 during the period beginning from the Effective Date through (and including) the end of the Federal Fiscal Year during which the Substantial Completion Date occurs; provided, that the Initial Construction Period Servicing Fee shall be due and payable within thirty (30) days after receipt by the Borrower of an invoice from the WIFIA Lender with respect thereto (or, if earlier, the date of the first Disbursement of the WIFIA Loan); and

(iii) the Operating Period Servicing Fee, which shall accrue on the first Business Day of the then-current Federal Fiscal Year and shall be due and payable on or prior to each November 15, beginning with the first November 15 following the end of the Federal Fiscal Year during which the Substantial Completion Date occurs, until (and including) the Final Maturity Date; provided, that the Operating Period Servicing Fee due and payable with respect to the Federal Fiscal Year during which the Final Maturity Date occurs shall be equal to the *pro-rata* monthly portion of the then applicable Operating Period Servicing Fee multiplied by the number of partial or whole months remaining between October 1 and the Final Maturity Date.

(b) The amount of each Construction Period Servicing Fee (other than the Initial Construction Period Servicing Fee) and each Operating Period Servicing Fee shall be adjusted in proportion to the percentage change in CPI for the calendar year immediately preceding the calendar year during which such fee is due. The WIFIA Lender shall notify the Borrower of the amount of each such fee at least thirty (30) days before payment is due, which determination shall be conclusive absent manifest error.

(c) Expenses. The Borrower agrees, whether or not the transactions hereby contemplated shall be consummated, to reimburse the WIFIA Lender on demand from time to time, within thirty (30) days after receipt by the Borrower of any invoice from the WIFIA Lender, for any and all fees, costs, charges, and expenses incurred by it (including the fees, costs, and expenses of its legal counsel, financial advisors, auditors and other consultants and advisors) in connection with the negotiation, preparation, execution, delivery, and performance of this Agreement and the other WIFIA Loan Documents and the transactions hereby and thereby contemplated, including attorneys', and engineers' fees and professional costs, including all such fees, costs, and expenses incurred as a result of or in connection with: (i) the enforcement of or attempt to enforce, or the monitoring, protection or preservation of any right or claim under, the Liens on the Pledged Collateral or any provision of this Agreement or any of the other WIFIA Loan Documents or the rights of the WIFIA Lender thereunder; (ii) any amendment, modification, re-execution, waiver, or consent with respect to this Agreement or any other WIFIA Loan

Document; and (iii) any work-out, restructuring, or similar arrangement of the obligations of the Borrower under this Agreement or the other WIFIA Loan Documents, including during the pendency of any Event of Default.

(d) The obligations of the Borrower under this Section 10 shall survive the payment or prepayment in full or transfer of the WIFIA Loan, the enforcement of any provision of this Agreement or the other WIFIA Loan Documents, any such amendments, waivers or consents with respect thereto, any Event of Default, and any work-out, restructuring, or similar arrangement of the obligations of the Borrower under this Agreement or the other WIFIA Loan Documents.

## ARTICLE III
## CONDITIONS PRECEDENT

Section 11. Conditions Precedent.

(a) Conditions Precedent to Effectiveness. Notwithstanding anything in this Agreement to the contrary, this Agreement shall not become effective until each of the following conditions precedent has been satisfied or waived in writing by the WIFIA Lender in its sole discretion:

(i) The Borrower shall have duly executed and delivered to the WIFIA Lender this Agreement, the WIFIA Bond and the other WIFIA Loan Documents, each in form and substance satisfactory to the WIFIA Lender.

(ii) The Borrower shall have delivered to the WIFIA Lender complete and fully executed copies of (A) any Parity Obligation Documents and (B) any Other Financing Document with respect to which all or a portion of the proceeds are or will be applied to fund all or any portion of Total Project Costs that has been entered into on or prior to the Effective Date, along with a certification in the Closing Certificate that each such document is complete, fully executed and in full force and effect, and that all conditions contained in the Related Documents that are necessary to the closing of the WIFIA transaction contemplated hereby (if any) have been fulfilled.

(iii) The Borrower shall have delivered to the WIFIA Lender fully executed copies of each Existing Construction Contract, together with any amendments, waivers or modifications thereto.

(iv) Counsel to the Borrower shall have rendered to the WIFIA Lender legal opinions satisfactory to the WIFIA Lender in its sole discretion (including those opinions set forth on **Exhibit H-1** (*Opinions Required from Counsel to Borrower*) and bond counsel to the Borrower shall have rendered to the WIFIA Lender legal opinions satisfactory to the WIFIA Lender in its sole discretion (including those opinions set forth on **Exhibit H-2** (*Opinions Required from Bond Counsel*)).

(v) The Borrower shall have delivered to the WIFIA Lender a certificate, signed by the Borrower's Authorized Representative, substantially in the form attached

hereto as **Exhibit B** (*Form of Closing Certificate*) (the "**Closing Certificate**"), designating the Borrower's Authorized Representative, confirming such person's position and incumbency, and certifying as to the satisfaction of the certain conditions precedent (and, if requested by the WIFIA Lender, has provided evidence satisfactory to the WIFIA Lender of such satisfaction), including the following:

(A) as of the Effective Date, (1) the Maximum Principal Amount, together with the amount of any other credit assistance provided under the Act to the Borrower, does not exceed eighty percent (80%) of reasonably anticipated Eligible Project Costs; (2) the aggregate amount of Eligible Project Costs previously incurred prior to the Effective Date does not exceed fifty-one percent (51%) of Eligible Project Costs; and (3) the total federal assistance provided to the Project, including the Maximum Principal Amount, does not exceed eighty percent (80%) of Total Project Costs;

(B) the Borrower is in compliance with NEPA and any applicable federal, state or local environmental review and approval requirements with respect to the Project;

(C) the Borrower has (1) obtained a FEIN (as evidenced by the delivery of a copy of the Borrower's W-9), (2) obtained a UEI, and (3) registered with SAM, and obtained confirmation of active SAM registration status with no exclusions;

(D) the Borrower has obtained the WIFIA CUSIP Number;

(E) the representations and warranties of the Borrower set forth in this Agreement and in each other WIFIA Loan Document to which the Borrower is a party are true and correct on and as of the date hereof, except to the extent that such representations and warranties expressly relate to an earlier date, in which case such representations and warranties were true and correct as of such earlier date;

(F) no Material Adverse Effect, or any event or condition that could reasonably be expected to have a Material Adverse Effect, has occurred or arisen since the date of the Application; and

(G) upon the issuance of the WIFIA Bond and the incurrence of the WIFIA Loan, the Borrower is in compliance with all requirements and conditions set forth in the Parity Obligation Documents in effect as of the Effective Date with respect to the parity status of the WIFIA Bond and has provided evidence satisfactory to the WIFIA Lender demonstrating such compliance;

(vi) The Borrower shall have provided evidence to the WIFIA Lender's satisfaction, prior to the Effective Date, of the assignment by at least one (1) Nationally Recognized Rating Agency of a public Investment Grade Rating on the WIFIA Loan, along

with a certification in the Closing Certificate that no such rating has been reduced, withdrawn or suspended as of the Effective Date.

(vii) The Borrower shall have delivered to the WIFIA Lender the Public Benefits Report.

(viii) The Borrower shall have paid in full all invoices delivered by the WIFIA Lender to the Borrower as of the Effective Date for any applicable Servicing Fees and the fees and expenses of the WIFIA Lender's counsel and financial advisors and any auditors or other consultants retained by the WIFIA Lender for the purposes hereof.

(ix) The Borrower shall have delivered to the WIFIA Lender duly executed copies of all consents that are required from (A) Clackamas County Bank under the Business Loan Agreement in effect as of the Effective Date and (B) the State, acting by and through its Department of Environmental Quality, under the DEQ Obligation Documents in effect as of the Effective Date, for the incurrence of the WIFIA Loan and the issuance of the WIFIA Bond pursuant to the WIFIA Loan Documents, which consents shall be in form and substance satisfactory to the WIFIA Lender, along with a certification in the Closing Certificate that all such consents shall have been delivered to the WIFIA Lender.

(x) The Borrower shall have delivered to the WIFIA Lender complete and fully executed copies of any amendments to the DEQ Obligation Documents executed and delivered in connection with the consent described in Section 11(a)(ix) above, which amendments shall be in form and substance satisfactory to the WIFIA Lender, along with a certification in the Closing Certificate that all such amendments shall have been delivered to the WIFIA Lender.

(b) Conditions Precedent to Disbursements. Notwithstanding anything in this Agreement to the contrary, the WIFIA Lender shall have no obligation to make any Disbursement of the WIFIA Loan to the Borrower (including the initial Disbursement hereunder) until each of the following conditions precedent has been satisfied or waived in writing by the WIFIA Lender in its sole discretion:

(i) The Borrower shall have delivered to the WIFIA Lender a Requisition that complies with the provisions of Section 4 (*Disbursement Conditions*), **Schedule IV** (*Requisition Procedures*) and **Exhibit D** (*Form of Requisition*), including satisfactory Eligible Project Costs Documentation relating to such Requisition. The Borrower's Authorized Representative shall also certify in such Requisition that:

(A) at the time of, and immediately after giving effect to, any Disbursement of WIFIA Loan proceeds then currently requested, (1) no Default or Event of Default and no event of default under any other Related Document has occurred and is continuing and (2) no event that, with the giving of notice or the passage of time or both, would constitute an event of default under any other Related Document, has occurred and is continuing;

(B) no Material Adverse Effect, or any event or condition that could reasonably be expected to result in a Material Adverse Effect, has occurred since the Effective Date;

(C) the aggregate amount of all Disbursements (including the requested Disbursement amount but excluding any interest that is capitalized in accordance with the terms hereof) does not exceed (1) the Maximum Principal Amount or (2) the amount of Eligible Project Costs paid or incurred by the Borrower;

(D) the Eligible Project Costs for which reimbursement or payment is being requested has not been reimbursed or paid by any previous disbursement of (1) WIFIA Loan proceeds or (2) any other source of funding for the Project as identified in the Project Budget;

(E) (1) the Borrower, and, to the best of its knowledge, each of its contractors and subcontractors at all tiers with respect to the Project, has complied with all applicable laws, rules, regulations and requirements, including 40 U.S.C. §§3141-3144, 3146, and 3147 (relating to Davis-Bacon Act requirements) (and regulations relating thereto) and 33 U.S.C. §3914 (relating to American iron and steel products); and (2) supporting documentation, such as certified payroll records and certifications for all iron and steel products used for the Project, are being maintained and are available for review upon request by the WIFIA Lender;

(F) the representations and warranties of the Borrower set forth in this Agreement and in each other WIFIA Loan Document are true and correct as of each date on which any disbursement of the WIFIA Loan is made, except to the extent such representations and warranties expressly relate to an earlier date (in which case, such representations and warranties are true and correct as of such earlier date);

(G) the Borrower has delivered all required deliverables under and in compliance with the requirements of **Schedule V** (*Reporting Requirements*), except as has been otherwise agreed by the WIFIA Lender; and

(H) the amount being requested for Disbursement is with respect to Eligible Project Costs for which all or a portion of the Eligible Project Costs Documentation was previously submitted to and approved by the WIFIA Lender in accordance with **Schedule IV** (*Requisition Procedures*) and **Schedule V** (*Reporting Requirements*), and/or the Borrower has set out in the Requisition (or attached separately to the Requisition) a summary of any Eligible Project Costs that have not otherwise been previously submitted to the WIFIA Lender for approval, together with supporting Eligible Project Costs Documentation.

(ii) If applicable, to the extent necessary to make the representations and warranties in Section 12(f) (*Litigation*) and Section 12(j)(iii) (*Compliance with Laws*) true, correct and complete as of the date of the applicable Disbursement, the Borrower shall have delivered an updated **Schedule III** (*Borrower Disclosures*).

(iii) The Borrower shall have paid in full (A) any outstanding Servicing Fees due and payable under Section 10 (*Fees and Expenses*) and (B) all invoices delivered by the WIFIA Lender to the Borrower, for the fees and expenses of the WIFIA Lender's counsel and financial advisors and any auditors or other consultants retained by the WIFIA Lender for the purposes hereof.

## ARTICLE IV
## REPRESENTATIONS AND WARRANTIES

Section 12. Representations and Warranties of Borrower. The Borrower hereby represents and warrants that, as of the Effective Date and, as to each of the representations and warranties below other than those contained in Section 12(b) (*Officers' Authorization*) and the first sentence of Section 12(m) (*Construction Contracts*), as of each date on which any Disbursement of the WIFIA Loan is requested or made:

(a) Organization; Power and Authority. The Borrower is a Legal Entity duly organized and validly existing under its Organizational Documents and the laws of the State, has full legal right, power and authority to do business in the State and to enter into the WIFIA Loan Documents then in existence, to execute and deliver this Agreement and the other WIFIA Loan Documents and to issue the WIFIA Bond, and to carry out and consummate all transactions contemplated hereby and thereby and has duly authorized the execution, delivery and performance of this Agreement, the WIFIA Bond, and the other WIFIA Loan Documents. Other than the Organizational Documents, the Authorizing Ordinance and the Authorizing Resolution, there are no additional instruments or documents necessary for the Borrower to execute and deliver, or to perform its obligations under, the WIFIA Loan Documents to which it is a party and to consummate and implement the transactions contemplated by the WIFIA Loan Documents.

(b) Officers' Authorization. As of the Effective Date, the officers of the Borrower executing (or that previously executed) the WIFIA Loan Documents, and any certifications or instruments related thereto, to which the Borrower is a party are (or were at the time of such execution) duly and properly in office and fully authorized to execute the same.

(c) Due Execution; Enforceability. Each of the WIFIA Loan Documents in effect as of any date on which this representation and warranty is made, and to which the Borrower is a party, has been duly authorized, executed and delivered by the Borrower and constitutes the legal, valid and binding agreement of the Borrower enforceable against the Borrower in accordance with its terms, except as such enforceability (i) may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws affecting the rights of creditors generally and (ii) is subject to general principles of equity (regardless of whether enforceability is considered in equity or at law).

(d) Non-Contravention. The execution and delivery of the WIFIA Loan Documents to which the Borrower is a party, the consummation of the transactions contemplated by the WIFIA Loan Documents, and the fulfillment of or compliance with the terms and conditions of all of the WIFIA Loan Documents, do not and will not (i) conflict with the Borrower's Organizational Documents, (ii) conflict in any material respect with, or constitute a violation, breach or default (whether immediately or after notice or the passage of time or both) by the Borrower of or under, any applicable law, administrative rule or regulation, any applicable court or administrative decree or order, or any indenture, mortgage, deed of trust, loan agreement, lease, contract or other agreement or instrument to which the Borrower is a party or by which it or its properties or assets are otherwise subject or bound, or (iii) result in the creation or imposition of any Lien, charge or encumbrance of any nature whatsoever upon any of the property or assets of the Borrower, other than Permitted Liens.

(e) Consents and Approvals. All Governmental Approvals required as of the Effective Date and required as of any subsequent date on which this representation is made (or deemed made) for the undertaking, construction and completion by the Borrower of the Project and the operation and maintenance of the Wastewater System, and to execute and deliver and perform its obligations under the WIFIA Loan Documents and the Construction Contracts, have been obtained or effected and are in full force and effect. The Borrower is not in default with respect to any Governmental Approval, which default could reasonably be expected to result in a Material Adverse Effect. No consent or approval of any trustee, holder of any indebtedness of the Borrower or any other Person is necessary in connection with the execution, delivery, and performance by the Borrower of the WIFIA Loan Documents and the consummation of any transaction contemplated thereunder, except as have been obtained or made and as are in full force and effect.

(f) Litigation. Except as set forth in **Part B of Schedule III** (*Borrower Disclosures*), there is no action, suit, proceeding or, to the knowledge of the Borrower, any inquiry or investigation, in any case before or by any court or other Governmental Authority pending or, to the knowledge of the Borrower, threatened against or affecting the Wastewater System, the Project or the ability of the Borrower to execute, deliver and perform its obligations under the WIFIA Loan Documents or that in any case could reasonably be expected to result in a Material Adverse Effect.

(g) Security Interests. (i) The WIFIA Loan Documents and the Organizational Documents together establish, and (ii) the Borrower has taken all necessary action to pledge, assign, and grant, in each case for the benefit of the WIFIA Lender, legal, valid, binding and enforceable Liens on the Pledged Collateral purported to be created, pledged, assigned, and granted pursuant to and in accordance with the WIFIA Loan Documents, irrespective of whether any Person has notice of the pledge and without the need for any physical delivery, recordation, filing, or further act, and if applicable, the security interests created in the Pledged Collateral have been duly perfected under applicable State law. Such Liens are in full force and effect and are not subordinate or junior to any other Liens in respect of the Pledged Collateral except for the Liens arising by operation of law, and not *pari passu* with any Liens other than the Liens on the Net Revenues in favor of the Parity Obligations (including, without limitation, the DEQ Obligations). The Borrower is not in breach of any covenant set forth in Section 14(b) (*Securing Liens*) with respect to the matters described in Section 14(b) (*Securing Liens*). As of the Effective Date and as of each

other date this representation and warranty is made, (A) all documents and instruments have been recorded or filed for record in such manner and in such places as are required and all other action as is necessary or desirable has been taken to establish a legal, valid, binding, and enforceable and, if applicable, perfected, Lien on the Pledged Collateral in favor of the WIFIA Lender) to the extent contemplated by the WIFIA Loan Documents, and (B) all taxes and filing fees that are due and payable in connection with the execution, delivery or recordation of any WIFIA Loan Documents or any instruments, certificates or financing statements in connection with the foregoing, have been paid. Neither the attachment, validity, enforceability, priority or, if applicable, perfection, of the security interest in the Pledged Collateral granted pursuant to the WIFIA Loan Documents is governed by Article 9 of the UCC.

(h) No Debarment. The Borrower has fully complied with its verification obligations under 2 C.F.R. § 180.320 and confirms, based on such verification, that neither the Borrower nor any of its principals (as defined in 2 C.F.R. § 180.995 and supplemented by 2 C.F.R § 1532.995) (i) is debarred, suspended or voluntarily excluded from participation in Government contracts, procurement or non-procurement matters, (ii) is presently indicted for or otherwise criminally or civilly charged by a Governmental Authority with commission of any of the offenses contemplated by 2 C.F.R. Part 180 or 2 C.F.R. Part 1532; or (iii) has, within the three (3) year period preceding the Effective Date, (x) been convicted for or had a civil judgment rendered against it or them for any of such offenses within such period or (y) had any public transactions (federal, state or local) terminated for cause or default.

(i) No Lobbying. Pursuant to 31 U.S.C. §1352, (A) no Federal appropriated funds have been paid or will be paid, by or on behalf of the Borrower, to any Person for influencing or attempting to influence an officer or employee of an agency, a member (or employee of a member), officer, or employee of the U.S. Congress, in connection with the making of the WIFIA Loan, execution (including amendments or modifications) of the WIFIA Loan Documents, or any other federal action under 31 U.S.C. §1352(a)(2); and (B) if any funds other than Federal appropriated funds have been paid or will be paid to any Person for influencing or attempting to influence an officer or employee of any agency, a member (or employee of a member), officer, or employee of the U.S. Congress in connection with the WIFIA Loan, the Borrower has completed and submitted to the WIFIA Lender Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(j) Compliance with Laws.

(i) The Borrower, and to the best of its knowledge, each of its contractors and subcontractors at all tiers with respect to the Project, has complied with all applicable laws, rules, regulations and requirements, including 40 U.S.C. §§3141-3144, 3146, and 3147 (relating to Davis-Bacon Act requirements) (and regulations relating thereto), 33 U.S.C. §3914 (relating to American iron and steel products), 2 C.F.R. §180.320 and 2 C.F.R. Part 1532 (relating to non-debarment), 31 U.S.C. §1352 and 40 C.F.R. §34.100 (relating to non-lobbying), and any applicable Sanctions Laws.

(ii) To ensure such compliance, the Borrower has included in all contracts with respect to the Project (A) the contract clauses relating to applicable federal requirements (such as Davis-Bacon and Equal Employment Opportunity) and (B)

requirements that its contractors (1) shall comply with all applicable laws, rules, regulations, and requirements set forth in this Section 12(j) and follow applicable federal guidance and (2) incorporate in all subcontracts (and cause all subcontractors to include in lower tier subcontracts) such terms and conditions as are required to be incorporated therein by any applicable laws, rules, regulations and requirements set forth in this Section 12(j).

(iii) Except as set forth in **Part C of Schedule III** (*Borrower Disclosures*), the Borrower is in compliance with all laws applicable to the Wastewater System (including the Project) relating to environmental, health or safety matters.

(k) Credit Ratings. The WIFIA Loan has received a public Investment Grade Rating from at least one (1) Nationally Recognized Rating Agency, written evidence of such rating has been provided to the WIFIA Lender prior to the Effective Date, and such rating has not been reduced, withdrawn or suspended as of the Effective Date.

(l) No Defaults. No Default or Event of Default, and no default or event of default by the Borrower under any other Related Document, has occurred and is continuing.

(m) Construction Contracts. **Part C of Schedule II** (*Project Details*) sets forth a list of the Existing Construction Contracts as of the Effective Date. With respect to each Construction Contract executed as of any date on which this representation and warranty is made, such Construction Contract is in full force and effect.

(n) Information. The information furnished by, or on behalf of, the Borrower to the WIFIA Lender, when taken as a whole, is true and correct in all material respects (other than for projections and other forward-looking statements contained in the Base Case Financial Model and any Updated Financial Model/Plan which have been made in good faith and based on reasonable assumptions) and does not contain any untrue statement of a material fact or omit to state any material fact necessary to make the statements contained therein, in light of the circumstances under which they were made, not misleading as of the date made or furnished.

(o) Insurance. The Borrower is in compliance with all insurance obligations required under each Construction Contract and the WIFIA Loan Documents (including Section 14(f) (*Insurance*) hereof) as of the date on which this representation and warranty is made. To the extent the Borrower self-insures, the Borrower's self-insurance program is actuarially sound.

(p) No Prohibited Liens. Except for Permitted Liens, the Borrower has not created, and is not under any obligation to create, and has not entered into any transaction or agreement that would result in the imposition of, any Lien on the Pledged Collateral, the Wastewater System, the Project, the Gross Revenues or the Net Revenues, or the Borrower's respective rights in any of the foregoing.

(q) Financial Statements. Each income statement, balance sheet and statement of operations and cash flows (collectively, "**Financial Statements**") delivered to the WIFIA Lender pursuant to **Part B of Schedule V** (*Reporting Requirements*) has been prepared in accordance with GAAP and presents fairly, in all material respects, the financial condition (including any liabilities or obligations that are required to be disclosed in accordance with GAAP) of the Borrower as of the respective dates of the balance sheets included therein and the results of

operations of the Borrower for the respective periods covered by the statements of income included therein.

(r) Securities Laws. Under existing law, the WIFIA Bond may be issued and sold without registration under the Securities Act of 1933, as amended, and any State blue sky laws, and the WIFIA Loan Documents are exempt from qualification pursuant to the Trust Indenture Act of 1939, as amended.

(s) No Delinquent Taxes or Federal Debt. The Borrower has paid all applicable taxes and other material taxes and assessments payable by it that have become due (other than those taxes or assessments that it is contesting in good faith and by appropriate proceedings, for which adequate reserves have been established to the extent required by GAAP). The Borrower has no delinquent federal debt (including tax liabilities but excluding any delinquencies that have been resolved with the appropriate federal agency in accordance with the standards of the Debt Collection Improvement Act of 1996).

(t) Sufficient Funds. The amount of the WIFIA Loan, when combined with all other funds committed for the development and construction of the Project as set forth under the various sources of funds in the Project Budget, will be sufficient to carry out the Project, pay all Total Project Costs anticipated for the development and construction of the Project and achieve Substantial Completion by the Projected Substantial Completion Date. The total federal assistance provided to the Project, including the Maximum Principal Amount, does not exceed eighty percent (80%) of Total Project Costs. The Updated Financial Model/Plan most recently delivered to the WIFIA Lender pursuant to **Part A of Schedule V** (*Reporting Requirements*) demonstrates that the projected Gross Revenues are sufficient to meet the WIFIA Loan Amortization Schedule. The Borrower has developed, and identified adequate revenues to implement, a plan for operating, maintaining, and repairing the Project over the useful life of the Project.

(u) Sovereign Immunity. The Borrower either has no immunity from the jurisdiction of any court of competent jurisdiction or from any legal process therein which could be asserted in any action to enforce the obligations of the Borrower under any of the WIFIA Loan Documents to which it is a party or the transactions contemplated hereby or thereby, including the obligations of the Borrower hereunder and thereunder, or, to the extent that the Borrower has such immunity, the Borrower has waived such immunity pursuant to Section 14(m) (*Immunity*).

(v) Accuracy of Representations and Warranties. The representations, warranties and certifications of the Borrower set forth in this Agreement and the other WIFIA Loan Documents are true, correct, and complete, except to the extent such representations and warranties expressly relate to an earlier date (in which case, such representations and warranties shall be true, correct, and complete as of such earlier date).

Section 13. Representations and Warranties of WIFIA Lender. The WIFIA Lender represents and warrants that:

(a) Power and Authority. The WIFIA Lender has all requisite power and authority to make the WIFIA Loan and to perform all transactions contemplated by the WIFIA Loan Documents to which it is a party.

(b) Due Execution; Enforceability. The WIFIA Loan Documents to which it is a party have been duly authorized, executed and delivered by the WIFIA Lender, and are legally valid and binding agreements of the WIFIA Lender, enforceable against the WIFIA Lender in accordance with their terms.

(c) Officers' Authorization. The officers of the WIFIA Lender executing each of the WIFIA Loan Documents to which the WIFIA Lender is a party are duly and properly in office and fully authorized to execute the same on behalf of the WIFIA Lender.

## ARTICLE V
## COVENANTS

Section 14. Affirmative Covenants. The Borrower covenants and agrees as follows until the date the WIFIA Bond and all of the obligations of the Borrower under this Agreement (other than contingent indemnity obligations) are irrevocably paid in full in immediately available funds and the WIFIA Lender no longer has any commitment to make Disbursements to the Borrower, unless the WIFIA Lender waives compliance in writing:

(a) Rate Covenant. The Borrower shall comply with all requirements and conditions specified in the Rate Covenant.

(b) Securing Liens. The Borrower shall at any and all times, to the extent permitted by law, pass, make, do, execute, acknowledge and deliver, all and every such further resolutions, acts, deeds, conveyances, assignments, transfers and assurances as may be necessary or desirable in connection with assuring, conveying, granting, assigning, securing and confirming the Liens on the Pledged Collateral (whether now existing or hereafter arising) granted to the WIFIA Lender for its benefit pursuant to the WIFIA Loan Documents, or intended so to be granted pursuant to the WIFIA Loan Documents, or which the Borrower may become bound to grant. The Borrower shall at all times maintain the Pledged Collateral free and clear of any Lien that has priority over, or equal rank with, the Liens created by the WIFIA Loan Documents, other than Permitted Liens, and all organizational, regulatory or other necessary action on the part of the Borrower to that end shall be duly and validly taken at all times. The Borrower shall at all times, to the extent permitted by law, defend, preserve and protect the Liens on the Pledged Collateral granted pursuant to the WIFIA Loan Documents and for the benefit of the WIFIA Lender under the WIFIA Loan Documents against all claims and demands of all Persons whomsoever, subject to Permitted Liens.

(c) Use of Proceeds. The Borrower shall use the proceeds of the WIFIA Loan solely for purposes permitted by applicable law, this Agreement and the other WIFIA Loan Documents.

(d) Prosecution of Work; Verification Requirements.

(i) The Borrower shall diligently prosecute the work relating to the Project and complete the Project in accordance with the Construction Schedule (and on or prior to the Development Default Date), the Governmental Approvals in connection with the Project, and prudent utility and industry practice.

(ii) The Borrower shall comply with Subpart C of 2 C.F.R. Part 180, as supplemented by Subpart C of 2 C.F.R. Part 1532 (relating to non-debarment), including the verification requirements set forth in 2 C.F.R. §§ 180.300 and 180.320, and shall include in its contracts with respect to the Project similar terms or requirements for compliance.

(e) Operations and Maintenance. The Borrower shall operate and maintain the Wastewater System (including the Project) substantially in accordance with the Updated Financial Model/Plan most recently delivered by the Borrower to the WIFIA Lender pursuant to **Part A of Schedule V** (*Reporting Requirements*) and its operations and maintenance plan (that incorporates the Project). The Borrower shall operate and maintain the Wastewater System (including the Project) in a reasonable and prudent manner and in good repair, working order and condition and in accordance with the requirements of all applicable laws and each applicable WIFIA Loan Document. The Borrower shall at all times do or cause to be done all things necessary to obtain, preserve, renew, extend and keep in full force and effect the Governmental Approvals and any other rights, licenses, franchises, and authorizations material to the conduct of its business and the operation and maintenance of the Wastewater System.

(f) Insurance.

(i) The Borrower shall at all times procure and maintain or cause to be maintained insurance on the Wastewater System and the construction of the Project, with responsible insurers, or as part of a reasonable system of self-insurance that is actuarially sound and adequately funded, in such amounts and against such risks (including damage to or destruction of the Wastewater System) as are customarily maintained with respect to works and properties of like character against accident to, loss of, or damage to such works or properties, including insurance against public liability, property damage, workers' compensation, and builders' risk, casualty and liability, as appropriate, and otherwise in accordance with the WIFIA Loan Documents and Construction Contracts. The insurance policies shall be available at all reasonable times for inspection upon request by the WIFIA Lender, its agents and representatives.

(ii) The Borrower shall cause all liability insurance policies that it maintains (excluding property damage, automobile or workers' compensation insurance), to reflect the WIFIA Lender as an additional insured to the extent of its insurable interest.

(g) Maintain Legal Structure. The Borrower shall maintain its existence as a Legal Entity organized and existing under its Organizational Documents and the laws of the State.

(h) System Accounts; Permitted Investments.

(i) The Borrower shall maintain the Wastewater Fund in accordance with the terms hereof and the WIFIA Loan Documents. The Borrower shall maintain the WIFIA Debt Service Account, the WIFIA Debt Service Reserve Account and the Rate Stabilization Account as discrete accounts in the Wastewater Fund as set forth in **Part D of Schedule I** (*WIFIA Loan Specific Terms*) and in accordance with the requirements and conditions set forth in **Annex D**. If the Borrower creates the Subordinate Obligations Account, that account shall also be maintained in the Wastewater Fund as set forth in **Part D of Schedule I** (*WIFIA Loan Specific Terms*) and in accordance with the requirements and conditions set forth in **Annex D**. All Gross Revenues received shall be deposited into the Wastewater Fund in accordance with the Flow of Funds. The Borrower shall not apply any portion of the Gross Revenues in contravention of this Agreement or the WIFIA Loan Documents. Any funds then on deposit in the WIFIA Debt Service Account (if applicable) shall only be used for payments of WIFIA Debt Service by the Borrower (or Trustee, if applicable, as directed by the Borrower) in accordance with the WIFIA Loan Documents.

(ii) If a WIFIA Debt Service Reserve Requirement is applicable as set forth in **Part D of Schedule I** (*WIFIA Loan Specific Terms*), the Borrower shall maintain the WIFIA Debt Service Reserve Account in an amount equal to the WIFIA Debt Service Reserve Requirement as set forth in **Part D of Schedule I** (*WIFIA Loan Specific Terms*). If the WIFIA Debt Service Reserve Account is funded with proceeds of the WIFIA Loan, amounts in the WIFIA Debt Service Reserve Account shall be applied only to make payments with respect to the WIFIA Bond.

(iii) Amounts on deposit in the System Accounts shall be held uninvested or invested in Permitted Investments. Permitted Investments must mature or be redeemable at the election of the holder at such times as may be necessary to ensure that funds will be available within the applicable account to be applied towards the purpose for which the applicable account has been established.

(i) Compliance with Laws.

(i) The Borrower shall, and shall require its contractors and subcontractors at all tiers with respect to the Project to, comply with all applicable laws, rules, regulations and requirements, including 40 U.S.C. §§3141-3144, 3146, and 3147 (relating to Davis-Bacon Act requirements) (and regulations relating thereto), 33 U.S.C. §3914 (relating to American iron and steel products), 2 C.F.R. § 180.320 and 2 C.F.R. Part 1532 (relating to non-debarment), 31 U.S.C. §1352 (relating to non-lobbying), and any applicable Sanctions Laws.

(ii) To ensure such compliance, the Borrower shall include in all contracts with respect to the Project (A) the contract clauses relating to applicable federal requirements (such as Davis-Bacon and Equal Employment Opportunity) and (B) requirements that its contractors (1) shall comply with all applicable laws, rules, regulations, and requirements set forth in this Section 14(i) and follow applicable federal

guidance and (2) incorporate in all subcontracts (and cause all subcontractors to include in lower tier subcontracts) such terms and conditions as are required to be incorporated therein by any applicable laws, rules, regulations and requirements set forth in this Section 14(i).

(j) Material Obligations. The Borrower shall pay its material obligations payable from the Gross Revenues or the Net Revenues promptly and in accordance with their terms and pay and discharge promptly all taxes, assessments and governmental charges or levies imposed upon it or upon the Pledged Collateral or other assets of the Wastewater System, before the same shall become delinquent or in default, as well as all lawful and material claims for labor, materials and supplies or other claims which, if unpaid, might give rise to a Lien upon the Wastewater System or any part thereof or on the Gross Revenues or the Net Revenues or the Pledged Collateral; provided, however, that such payment and discharge shall not be required with respect to any such tax, assessment, charge, levy, claim or Lien so long as the validity or amount thereof shall be contested by the Borrower in good faith by appropriate proceedings and so long as the Borrower shall have set aside adequate reserves with respect thereto in accordance with and to the extent required by GAAP, applied on a consistent basis. The Borrower shall comply with the Parity Obligation Documents.

(k) SAM Registration and UEI. The Borrower shall obtain and maintain, on or prior to the Effective Date through (i) the Final Disbursement Date, an active SAM registration status and (ii) the Final Maturity Date, a UEI.

(l) Events of Loss; Loss Proceeds. If an Event of Loss shall occur with respect to the Wastewater System (including the Project) or any part thereof, the Borrower shall (i) diligently pursue all of its rights to compensation against all relevant insurers, reinsurers and Governmental Authorities, as applicable, in respect of such Event of Loss and (ii) apply all Loss Proceeds (after excluding any proceeds of delay-in-start-up insurance and proceeds covering liability of the Borrower to third parties) in respect of such Event of Loss to repair, reconstruct, and/or replace the portion of the Wastewater System in respect of which the applicable Loss Proceeds were received. The Borrower shall begin such repair, reconstruction or replacement promptly after such damage or destruction shall occur, and shall continue and properly complete such repair, reconstruction or replacement as expeditiously as possible, and shall pay out of such Loss Proceeds (after excluding any proceeds of delay-in-start-up insurance and proceeds covering liability of the Borrower to third parties) all costs and expenses in connection with such repair, reconstruction or replacement so that the same shall be completed and the Wastewater System shall be free and clear of all claims and Liens.

(m) Immunity. To the fullest extent permitted by applicable law, the Borrower agrees that it will not assert any immunity (and hereby waives any such immunity) it may have as a governmental entity from lawsuits, other actions and claims, and any judgments with respect to the enforcement of any of the obligations of the Borrower under this Agreement or any other WIFIA Loan Document.

(n) Accounting and Audit Procedures.

(i) The Borrower shall establish fiscal controls and accounting procedures sufficient to assure proper accounting for all (A) Gross Revenues, operating

expenses, capital expenses, depreciation, reserves, debt issued and outstanding and debt payments and (B) Project-related costs, Requisitions submitted, WIFIA Loan proceeds received, payments made by the Borrower with respect to the Project, and other sources of funding for the Project (including amounts paid from such sources for Project costs so that audits may be performed to ensure compliance with and enforcement of this Agreement). The Borrower shall use accounting, audit and fiscal procedures conforming to GAAP, including, with respect to the WIFIA Loan, accounting of principal and interest payments, disbursements, prepayments and calculation of interest and principal amounts Outstanding.

(ii) The Borrower shall have a single or program-specific audit conducted in accordance with 2 C.F.R. Part 200 Subpart F and 31 U.S.C. § 7502 from (and including) the first Borrower Fiscal Year in which a Disbursement is made under this Agreement and annually thereafter to the extent required by applicable law, except in all cases to the extent biennial audits are permitted for the Borrower pursuant to 2 C.F.R. § 200.504 and 31 U.S.C. § 7502(b). Upon reasonable notice, the Borrower shall cooperate fully in the conduct of any periodic or compliance audits conducted by the WIFIA Lender, or designees thereof, pursuant to 40 C.F.R. Part 35, 31 U.S.C. § 7503(b), or 31 U.S.C. § 6503(h) and shall provide full access to any books, documents, papers or other records that are pertinent to the Project or the WIFIA Loan, to the WIFIA Lender, or the designee thereof, for any such project or programmatic audit.

(o) Access; Records.

(i) So long as the WIFIA Loan or any portion thereof shall remain Outstanding and until five (5) years after the WIFIA Loan shall have been paid in full, the WIFIA Lender shall have the right, upon reasonable prior notice, to visit, monitor and/or inspect any portion of the Project and its operations, to examine books of account and records of the Borrower relating to the Project, to make copies and extracts therefrom at the Borrower's expense, and to discuss the Borrower's affairs, finances and accounts relating to the Project with, and to be advised as to the same by, its officers and employees and its independent public accountants (and by this provision the Borrower irrevocably authorizes its independent public accountants to discuss with the WIFIA Lender the affairs, finances and accounts of the Borrower, whether or not any representative of the Borrower is present, it being understood that nothing contained in this Section 14(o) is intended to confer any right to exclude any such representative from such discussions), all at such reasonable times and intervals as the WIFIA Lender may request. The Borrower agrees to pay all out-of-pocket expenses incurred by the WIFIA Lender in connection with the WIFIA Lender's exercise of its rights under this Section 14(o) at any time when an Event of Default shall have occurred and be continuing.

(ii) The Borrower shall maintain and retain all pertinent files relating to the Project and the WIFIA Loan, as may be necessary for the WIFIA Lender to facilitate an effective and accurate audit and performance evaluation of the Project, until five (5) years after the later of the date on which (A) all rights and duties under this Agreement and under the WIFIA Bond (including payments) have been fulfilled and any required audits have been performed and (B) any litigation relating to the Project, the WIFIA Loan or this Agreement is finally resolved or, if the WIFIA Lender has reasonable cause to extend such

date, a date to be mutually agreed upon by the WIFIA Lender and the Borrower. The Borrower shall provide to the WIFIA Lender in a timely manner all records and documentation relating to the Project that the WIFIA Lender may reasonably request from time to time.

(p) General Covenants.

(i) The Borrower shall maintain complete books and records relating to the Wastewater System in accordance with generally accepted accounting principles in the United States of America, shall cause such books and records to be audited annually at the end of each Borrower Fiscal Year.

(ii) The Borrower shall promptly deposit the Gross Revenues and other amounts described in this Agreement into the funds and accounts specified in this Agreement.

(iii) The Borrower shall not enter into any agreement to provide Wastewater System products or services at a discount from published rate schedules or provide free Wastewater System products or services, except in the case of emergencies.

(iv) The City Council of the Borrower hereby finds and determines that the continuous imposition of the Wastewater System and the collection, deposit and disbursement of the Net Revenues in the manner provided in this Agreement are essential to the payment and security of the WIFIA Loan, and the failure or refusal of the Borrower to perform the covenants and obligations contained in this Agreement will endanger the necessary continuous operation of the Wastewater System and the application of the Net Revenues to the operation of the Wastewater System and the payment of the WIFIA Loan.

Section 15. Negative Covenants. The Borrower covenants and agrees as follows until the date the WIFIA Bond and all of the obligations of the Borrower under this Agreement (other than contingent indemnity obligations) are irrevocably paid in full in immediately available funds and the WIFIA Lender no longer has any commitment to make Disbursements to the Borrower, unless the WIFIA Lender waives compliance in writing:

(a) Indebtedness.

(i) Program Requirements. The Borrower may not create, incur or suffer to exist (A) any Obligations (1) the payments with respect to which are senior or prior in right of payment by the Borrower of the WIFIA Loan or (2) secured by a Lien on the Pledged Collateral that is senior to the Lien on the Pledged Collateral in favor of the WIFIA Lender or (3) all or a portion of the proceeds of which are or will be applied at any time to fund all or any portion of Total Project Costs, that are secured by a Lien on any assets or property of the Borrower other than the Pledged Collateral. The Borrower shall not incur any indebtedness of any kind payable from, secured or supported by the Pledged Collateral, including Permitted Debt, without the prior written consent of the WIFIA Lender, while an Event of Default relating to a Payment Default or a Bankruptcy Related Event has occurred and is continuing.

(ii) Issuance of Additional Parity Obligations. The Borrower shall not issue or incur any Additional Parity Obligations except in accordance with all requirements and conditions set forth in the Additional Parity Obligations Test.

(iii) Issuance of Subordinate Obligations. The Borrower shall not issue create, incur or suffer to exist any Subordinate Obligations unless such Subordinate Obligations (A) are payable solely from amounts permitted to be deposited in the Subordinate Obligations Account pursuant to the Flow of Funds, (B) state clearly that they are secured by a lien on or pledge of the Net Revenues that is subordinate to the lien on, and pledge of, the Net Revenues for the Parity Obligations, (C) are fully subordinated to the Parity Obligations in priority of payment (as to both principal and interest), voting and priority of security interest in the Net Revenues, including with respect to payment from revenues and reserves and payment upon default or acceleration of any such Subordinate Obligations; provided that no Subordinate Obligation Document shall supersede or conflict with any provision of this Section 15(a) or contain a right to accelerate without the consent of the WIFIA Lender.

(b) No Lien Extinguishment or Adverse Amendments. The Borrower shall not, and shall not permit any Person to, without the prior written consent of the WIFIA Lender, (i) extinguish the Rate Covenant; (ii) extinguish or impair the Liens on the Pledged Collateral or any dedicated source of repayment of the WIFIA Loan or any other Obligations (the proceeds of which are applied to fund Total Project Costs), in each case granted pursuant to the WIFIA Loan Documents or the Other Financing Documents, as applicable, (iii) amend, modify, replace or supplement any Related Document or permit a waiver of any provision thereof in a manner that could adversely affect the WIFIA Lender or could reasonably be expected to result in a Material Adverse Effect, or (iv) terminate, assign or replace any Related Document in a manner that could adversely affect the WIFIA Lender or could reasonably be expected to have a Material Adverse Effect.

(c) No Prohibited Liens. Except for Permitted Liens, the Borrower shall not create, incur, assume or permit to exist any Lien on the Project, the Pledged Collateral, the Gross Revenues or the Net Revenues, or the Borrower's respective rights in any of the foregoing and the Pledged Collateral will be free and clear of any Lien that is of equal rank with or senior to the pledge of the Borrower created under the WIFIA Loan Documents for the benefit of the WIFIA Lender.

(d) Restricted Payments and Transfers. The Borrower shall not permit Gross Revenues or other assets of the Wastewater System, or any funds in any accounts held under the WIFIA Loan Documents or in any other fund or account held by or on behalf of the Borrower, to be paid or transferred or otherwise applied for purposes other than ownership, operation or maintenance of the Wastewater System.

(e) No Prohibited Sale, Lease or Assignment. The Borrower shall not sell, lease or assign its rights in and to the Wastewater System or a substantial portion of the assets included in the Wastewater System, unless such sale, lease or assignment (i) could not reasonably be expected to have a Material Adverse Effect and (ii) is made by the Borrower in the ordinary course of business.

(f) Mergers and Acquisitions. The Borrower shall not, and shall not agree to, reorganize, consolidate with or merge into another Person unless (i) such reorganization, merger or consolidation is with or into another entity established by State law and such reorganization, merger or consolidation is permitted by State law, and in each case, does not adversely affect or impair to any extent or in any manner (A) the Gross Revenues or the Net Revenues or other elements of the Pledged Collateral or (B) the availability of the Net Revenues for the payment and security of the obligations of the Borrower under this Agreement; and (ii) the Borrower provides to the WIFIA Lender notice of such reorganization, consolidation or merger in accordance with **Part E of Schedule V** (*Reporting Requirements*) and such other information concerning such reorganization, consolidation or merger as shall have been reasonably requested by the WIFIA Lender.

(g) Hedging. The Borrower shall not enter into any swap or hedging transaction, including any such transaction that is speculative or creates extraordinary leverage or risk, without the prior written consent of the WIFIA Lender.

(h) Separate Utility System. The Borrower may not declare property which the Borrower owns and is part of the Wastewater System and property which the Borrower has not yet acquired but would otherwise become part of the Wastewater System, to be part of a Separate Utility System.

Section 16. Reporting Requirements. The Borrower agrees to comply with each of the reporting requirements set out in **Schedule V** (*Reporting Requirements*), unless otherwise agreed or waived by the WIFIA Lender in writing.

## ARTICLE VI
## EVENTS OF DEFAULT AND REMEDIES

Section 17. Events of Default and Remedies.

(a) An "**Event of Default**" shall exist under this Agreement if any of the following occurs; provided, that the occurrence of an event set forth in sub-clauses (v) through (and including) (x) below shall not constitute an Event of Default under this Agreement until the WIFIA Lender has provided a notice of such Event of Default to the Borrower; provided, further, that nothing in this paragraph is intended to limit any obligation of the Borrower hereunder, including any obligation to cure any event or condition contemplated under this Section 17(a):

(i) Payment Default. The Borrower shall fail to pay when due any part of the principal amount of or interest on the WIFIA Loan (including WIFIA Debt Service required to have been paid pursuant to the provisions of Section 8 (*Repayments*)), and such failure continues for a period of five (5) days, when and as the payment thereof shall be required under this Agreement or the WIFIA Bond or on the Final Maturity Date (each such failure, a "**Payment Default**").

(ii) Occurrence of a Bankruptcy Related Event. A Bankruptcy Related Event shall occur with respect to the Borrower.

(iii) Acceleration of Obligations. Any acceleration shall occur of the maturity of any Obligation, or any such Obligation shall not be paid in full upon the final maturity thereof.

(iv) Invalidity of WIFIA Loan Documents. (A) Any WIFIA Loan Document ceases to be in full force and effect (other than as a result of the termination thereof in accordance with its terms) or becomes void, voidable, illegal or unenforceable, or the Borrower contests in any manner the validity or enforceability of any WIFIA Loan Document to which it is a party or denies it has any further liability under any WIFIA Loan Document to which it is a party, or purports to revoke, terminate or rescind any WIFIA Loan Document to which it is a party; (B) any WIFIA Loan Document ceases (other than as expressly permitted thereunder) to be effective or to grant a valid and binding security interest on any material portion of the Pledged Collateral other than as a result of actions or a failure to act by, and within the control of, the Trustee, the WIFIA Lender, or any other holder of Obligations secured by the Pledged Collateral, and with the priority purported to be created thereby; or (C) any event occurs that results in the impairment in the validity, enforceability, perfection or priority of the WIFIA Lender's security interest in the Pledged Collateral.

(v) Covenant Default. The Borrower shall fail to observe or perform any covenant, agreement or obligation of the Borrower under this Agreement, the WIFIA Bond or any other WIFIA Loan Document (other than in the case of any Payment Default or any Development Default), and such failure shall not be cured within thirty (30) days after the earlier to occur of (A) receipt by the Borrower from the WIFIA Lender of written notice thereof or (B) the Borrower's knowledge of such failure; provided, that if such failure is capable of cure but cannot reasonably be cured within such thirty (30) day cure period, then such thirty (30) day cure period shall be extended by up to one hundred fifty (150) additional days, if and so long as (x) within such thirty (30) day cure period the Borrower shall commence actions reasonably designed to cure such failure and shall diligently pursue such actions until such failure is cured and (y) such failure is cured within one hundred eighty (180) days of the date specified in either (A) or (B) above, as applicable.

(vi) Misrepresentation Default. Any of the representations, warranties or certifications of the Borrower made in or delivered pursuant to the WIFIA Loan Documents (or in any certificates delivered by the Borrower in connection with the WIFIA Loan Documents) shall prove to have been false or misleading in any material respect when made or deemed made; provided, that no Event of Default shall be deemed to have occurred under this Section 17(a)(vi) if and so long as (A) such misrepresentation is not intentional, (B) such misrepresentation is not a misrepresentation in respect of Section 12(g) (*Security Interests*), Section 12(h) (*No Debarment*), Section 12(i) (*No Lobbying*), or Section 12(j) (*Compliance with Laws*), (C) in the reasonable determination of the WIFIA Lender, such misrepresentation has not had, and would not reasonably be expected to result in, a Material Adverse Effect, (D) in the reasonable determination of the WIFIA Lender, the underlying issue giving rise to the misrepresentation is capable of being cured and (E) the underlying issue giving rise to the misrepresentation is cured by the Borrower within thirty (30) days after the date on which the Borrower first became aware (or reasonably should have become aware) of such misrepresentation.

(vii) Enforcement of Related Documents and Loan Documents. (A) The holder(s) of Obligations under a Related Document exercises or is otherwise permitted to exercise remedies permitted thereunder for an event of default that has occurred and is continuing (and has not been cured or waived by the expiration of any applicable grace period), in respect of the performance of any covenant, agreement or obligation of the Borrower under such Related Document; or (B) the Borrower defaults in the performance or observance of any covenants or agreements contained in any Related Document (including any DEQ Obligation Document) or in any loan documents between itself and any lender or lenders, and the default remains uncured upon the expiration of any cure period provided by said Related Document or loan documents, as applicable.

(viii) Material Adverse Judgment. Any final, non-appealable judgment related to the Pledged Collateral that results in the impairment of (A) the Borrower's ability to comply with any of its payment obligations under the WIFIA Bond or this Agreement or (B) the existence, priority or perfection (if applicable) of the WIFIA Lender's security interest in the Pledged Collateral.

(ix) Development Default. A Development Default shall occur.

(x) Sale or Transfer. If the Borrower shall (except as herein permitted) sell, transfer, assign or convey any properties constituting the Wastewater System or interests therein, or any part or parts thereto or shall make any agreement for such sale or transfer (except as expressly authorized by this Section 17).

(b) Upon the occurrence of any Bankruptcy Related Event, all obligations of the WIFIA Lender hereunder with respect to the Disbursement of any undisbursed amounts of the WIFIA Loan shall automatically be deemed terminated.

(c) Upon the occurrence of any Event of Default, the WIFIA Lender, by written notice to the Borrower, may exercise any or all of the following remedies:

(i) the WIFIA Lender may suspend or terminate all of its obligations hereunder with respect to the Disbursement of any undisbursed amounts of the WIFIA Loan;

(ii) the WIFIA Lender may cease permitting interest on the WIFIA Loan to be capitalized (if applicable);

(iii) the WIFIA Lender may apply the Default Rate provisions of Section 6 (*Interest Rate*);

(iv) the WIFIA Lender may suspend or debar the Borrower from further participation in any Federal Government program administered by the WIFIA Lender and notify other departments and agencies of such default; and

(v) the WIFIA Lender shall be entitled and empowered to institute any actions or proceedings at law or in equity for the collection of any sums due and unpaid hereunder or under the WIFIA Bond or the other WIFIA Loan Documents, and may

prosecute any such judgment or final decree against the Borrower and collect in the manner provided by law out of the property of the Borrower the moneys adjudged or decreed to be payable, and the WIFIA Lender shall have all of the rights and remedies of a creditor, including all rights and remedies of a secured creditor under the Uniform Commercial Code (if applicable), and may take such other actions at law or in equity as may appear necessary or desirable to collect all amounts payable by the Borrower under this Agreement, the WIFIA Bond or the other WIFIA Loan Documents then due and thereafter to become due, or to enforce performance and observance of any obligation, agreement or covenant of the Borrower under this Agreement, the WIFIA Bond or the other WIFIA Loan Documents.

(d) Upon the occurrence of any Event of Default, the WIFIA Lender may declare the unpaid principal amount of the WIFIA Bond to be, and the same shall thereupon forthwith become, immediately due and payable, together with the interest accrued thereon and all fees, costs, expenses, indemnities and other amounts payable under this Agreement, the WIFIA Bond or the other WIFIA Loan Documents, all without presentment, demand, notice, declaration, protest or other requirements of any kind, all of which are hereby expressly waived.

(e) No action taken pursuant to this Section 17 shall relieve the Borrower from its obligations pursuant to this Agreement, the WIFIA Bond or the other WIFIA Loan Documents, all of which shall survive any such action.

## ARTICLE VII
## MISCELLANEOUS

Section 18. Disclaimer of Warranty. The WIFIA Lender makes no warranty or representation, either express or implied, as to the value, design, condition, merchantability or fitness for a particular purpose or fitness for use of the Project or any portion thereof or any other warranty with respect thereto. In no event shall the WIFIA Lender be liable for any incidental, indirect, special or consequential damages incidental to or arising out of this Agreement or the Wastewater System (including the Project) or the existence, furnishing, functioning or use of the Project or any item or products or services provided for in this Agreement.

Section 19. No Personal Recourse. No official, employee or agent of the WIFIA Lender or the Borrower or any Person executing this Agreement or any of the other WIFIA Loan Documents shall be personally liable on this Agreement or such other WIFIA Loan Documents by reason of the issuance, delivery or execution hereof or thereof.

Section 20. No Third-Party Rights. The parties hereby agree that this Agreement creates no third-party rights against the Borrower, the Federal Government, or the WIFIA Lender, solely by virtue of the WIFIA Loan, and that no third-party creditor of the Borrower shall have any right against the WIFIA Lender with respect to the WIFIA Loan made pursuant to this Agreement.

Section 21. Borrower's Authorized Representative. The Borrower shall at all times have appointed a Borrower's Authorized Representative by designating such Person or Persons from time to time to act on the Borrower's behalf pursuant to a written certificate furnished to the

WIFIA Lender and the Servicer, if any, containing the specimen signature or signatures of such Person or Persons and signed by the Borrower.

Section 22. WIFIA Lender's Authorized Representative. The WIFIA Lender hereby appoints the Director of the WIFIA Program, whose notice details are set forth below in Section 31 (*Notices*), to serve as the WIFIA Lender's Authorized Representative under this Agreement until such time as a successor or successors shall have been appointed. Thereafter, the successor in office shall serve as the WIFIA Lender's Authorized Representative. The WIFIA Lender shall provide notice to the Borrower within a reasonable time period following the succession.

Section 23. Servicer. The WIFIA Lender may from time to time designate another entity or entities to perform, or assist the WIFIA Lender in performing, the duties of the Servicer or specified duties of the WIFIA Lender under this Agreement and the WIFIA Bond. The WIFIA Lender shall give the Borrower written notice of the appointment of any successor or additional Servicer and shall enumerate the duties or any change in duties to be performed by any Servicer. Any references in this Agreement to the WIFIA Lender shall be deemed to be a reference to the Servicer with respect to any duties which the WIFIA Lender shall have delegated to such Servicer. The WIFIA Lender may at any time assume the duties of any Servicer under this Agreement and the WIFIA Bond. The Borrower shall cooperate and respond to any reasonable request of the Servicer for information, documentation or other items reasonably necessary for the performance by the Servicer of its duties hereunder.

Section 24. Amendments, Waivers and Termination. No amendment, modification, termination, or waiver of any provision of this Agreement or the WIFIA Bond shall in any event be effective without the prior written consent of each of the parties hereto. Notwithstanding the foregoing sentence, if the first Disbursement of the WIFIA Loan has not occurred on or prior to the Final Disbursement Date, the WIFIA Lender or the Borrower may terminate this Agreement upon no less than ten (10) Business Days' prior written notice to the other party. Once terminated, this Agreement may not be reinstated.

Section 25. Governing Law. This Agreement shall be governed by the federal laws of the United States of America if and to the extent such federal laws are applicable and the internal laws of the State, if and to the extent such federal laws are not applicable.

Section 26. Severability. In case any provision in or obligation under this Agreement shall be invalid, illegal, or unenforceable in any jurisdiction, the validity, legality and enforceability of the remaining provisions or obligations, or of such provision or obligation in any other jurisdiction, shall not in any way be affected or impaired thereby.

Section 27. Successors and Assigns. This Agreement shall be binding upon the parties hereto and their respective permitted successors and assigns and shall inure to the benefit of the parties hereto and their permitted successors and assigns. Neither the Borrower's rights nor obligations hereunder or under the WIFIA Bond nor any interest herein or therein may be assigned or delegated by the Borrower without the prior written consent of the WIFIA Lender.

Section 28. Remedies Not Exclusive. No remedy conferred herein or in the WIFIA Bond or reserved to the WIFIA Lender is intended to be exclusive of any other available remedy

or remedies, but each and every such remedy shall be cumulative and shall be in addition to every other remedy given hereunder or under the WIFIA Bond or now or hereafter existing at law or in equity or by statute.

Section 29. Delay or Omission Not Waiver. No delay or omission of the WIFIA Lender to exercise any right or remedy provided hereunder or under the WIFIA Bond upon a default of the Borrower (except a delay or omission pursuant to a written waiver) shall impair any such right or remedy or constitute a waiver of any such default or acquiescence therein. Every right and remedy given by this Agreement or under the WIFIA Bond or by law to the WIFIA Lender may be exercised from time to time, and as often as may be deemed expedient by the WIFIA Lender.

Section 30. Counterparts. This Agreement and any amendments, waivers, consents or supplements hereto or in connection herewith may be executed in any number of counterparts and by the different parties hereto in separate counterparts, each of which when so executed and delivered shall be deemed an original, but all such counterparts together shall constitute one and the same instrument; signature pages may be detached from multiple separate counterparts and attached to a single counterpart so that all signature pages are physically attached to the same document. Electronic delivery of an executed counterpart of a signature page of this Agreement or of any document or instrument delivered in connection herewith in accordance with Section 31 (*Notices*) shall be effective as delivery of an original executed counterpart of this Agreement or such other document or instrument, as applicable.

Section 31. Notices.

(a) All notices, requests, or communication hereunder shall be given in writing.

(b) Notices to the WIFIA Lender should be made by (i) email to the email address noted below for the WIFIA Lender or (ii) submission through another electronic medium or transmission system as designated by and in a format acceptable to the WIFIA Lender, unless otherwise instructed by the WIFIA Lender:

If to WIFIA Lender: Environmental Protection Agency
WJC-E 7334A
1200 Pennsylvania Avenue NW
Washington, D.C. 20460
Attention: WIFIA Director
Email: WIFIA_Portfolio@epa.gov

(c) Notices to the Borrower should be made by (i) nationally recognized courier service, (ii) hand delivery, (iii) email, to the email address noted below for the Borrower, or (iv) another electronic medium in a format acceptable to the Borrower, unless otherwise instructed by the Borrower's Authorized Representative:

If to Borrower: The notice details set forth in **Part G of Schedule I** (*WIFIA Loan Specific Terms*)

(d) Each such notice, request or communication shall be effective (x) if delivered by hand or by nationally recognized courier service, when delivered at the address specified in this Section 31 (or in accordance with the latest unrevoked written direction from the receiving party), and (y) if given by email or other electronic method, when such email is delivered to the email address specified in this Section 31 or submitted to the electronic medium as directed by the receiving party, in each case with the sender's receipt of an acknowledgement from the intended recipient (such as by a "read receipt," return email, or other written acknowledgement) (or in accordance with the latest unrevoked written direction from the receiving party); provided, that notices received on a day that is not a Business Day or after 5:00 p.m. Eastern Time on a Business Day will be deemed to be effective on the next Business Day.

Section 32. Indemnification. The Borrower shall, to the extent permitted by law, indemnify the WIFIA Lender, the Servicer (if any), and any official, employee, agent, advisor or representative of the WIFIA Lender (each such Person being herein referred to as an "**Indemnitee**") against, and hold each Indemnitee harmless from, any and all losses, claims, damages, liabilities, fines, penalties, costs and expenses (including the fees, charges and disbursements of any counsel for any Indemnitee and the costs of environmental remediation), whether known, unknown, contingent or otherwise, incurred by or asserted against any Indemnitee arising out of, in connection with, or as a result of (a) the execution, delivery and performance of this Agreement, any Construction Contract, or any Related Document, (b) the WIFIA Loan or the use of the proceeds thereof, or (c) the violation of any law, rule, regulation, order, decree, judgment or administrative decision relating to the environment, the preservation or reclamation of natural resources, the management, release or threatened release of any hazardous material or to health and safety matters; in each case arising out of or in direct relation to the Project; provided, that such indemnity shall not, as to any Indemnitee, be available to the extent that such losses, claims, damages, liabilities, fines, penalties, costs or related expenses are determined by a court of competent jurisdiction by final and non-appealable judgment to have resulted from the gross negligence or willful misconduct of such Indemnitee. In case any action or proceeding is brought against an Indemnitee by reason of any claim with respect to which such Indemnitee is entitled to indemnification hereunder, the Borrower shall be entitled, at its expense, to participate in the defense thereof; provided, that such Indemnitee has the right to retain its own counsel, at the Borrower's expense, and such participation by the Borrower in the defense thereof shall not release the Borrower of any liability that it may have to such Indemnitee. Any Indemnitee against whom any indemnity claim contemplated in this Section 32 is made shall be entitled, after consultation with the Borrower and upon consultation with legal counsel wherein such Indemnitee is advised that such indemnity claim is meritorious, to compromise or settle any such indemnity claim. Any such compromise or settlement shall be binding upon the Borrower for purposes of this Section 32. Nothing herein shall be construed as a waiver of any legal immunity that may be available to any Indemnitee. To the extent permitted by applicable law, neither the Borrower nor the WIFIA Lender shall assert, and each of the Borrower and the WIFIA Lender hereby waives, any claim against any Indemnitee or the Borrower, respectively, on any theory of liability, for special, indirect, consequential or punitive damages (as opposed to direct or actual damages) arising out of, in connection with, or as a result of, this Agreement, any Construction Contract, or any Related Document, the other transactions contemplated hereby and thereby, the WIFIA Loan or the use of the proceeds thereof, provided, that nothing in this sentence shall limit the Borrower's indemnity obligations to the extent such damages are included in any third-party claim in connection with which an Indemnitee is entitled to indemnification hereunder. All amounts due to any Indemnitee

under this Section 32 shall be payable promptly upon demand therefor. The obligations of the Borrower under this Section 32 shall survive the payment or prepayment in full or transfer of the WIFIA Loan, the enforcement of any provision of this Agreement or the other Related Documents, any amendments, waivers (other than amendments or waivers in writing with respect to this Section 32) or consents in respect hereof or thereof, any Event of Default, and any work-out, restructuring or similar arrangement of the obligations of the Borrower hereunder or thereunder.

Section 33. Sale of WIFIA Loan. The WIFIA Lender shall not sell the WIFIA Loan at any time prior to the later of (a) the Substantial Completion Date and (b) other than with respect to a sale or transfer to another governmental entity within the Federal Government, the Final Disbursement Date. After such date, the WIFIA Lender may sell the WIFIA Loan to another entity or reoffer the WIFIA Loan into the capital markets only in accordance with the provisions of this Section 33. Such sale or reoffering shall be on such terms as the WIFIA Lender shall deem advisable. However, in making such sale or reoffering the WIFIA Lender shall not change the terms and conditions of the WIFIA Loan without the prior written consent of the Borrower in accordance with Section 24 (*Amendments, Waivers and Termination*). Prior to any sale or reoffering of the WIFIA Loan, the WIFIA Lender shall provide reasonable written notice to the Borrower of the WIFIA Lender's intention to consummate such a sale or reoffering. The provision of any notice pursuant to this Section 33 shall neither (x) obligate the WIFIA Lender to sell nor (y) provide the Borrower with any rights or remedies in the event the WIFIA Lender, for any reason, does not sell the WIFIA Loan.

Section 34. Effectiveness. This Agreement shall be effective on the Effective Date.

Section 35. Release of Lien. Upon the irrevocable payment in full in immediately available funds by the Borrower of the WIFIA Loan Balance, together with all accrued interest, fees and expenses with respect thereto, the WIFIA Lender shall cancel and discharge the Lien on the Pledged Collateral and surrender the WIFIA Bond to the Borrower in accordance with Section 9(b) (*General Prepayment Instructions*).

Section 36. Survival. The indemnification requirements of Section 32 (*Indemnification*), the reporting and record keeping requirements of Section 14(o) (*Access; Records*) and the payment requirements of Section 10 (*Fees and Expenses*) shall survive the termination of this Agreement as provided in such Sections.

Section 37. Integration. This Agreement, together with the other WIFIA Loan Documents, constitutes the entire contract between the parties relating to the subject matter hereof and supersedes any and all previous agreements and understandings, oral or written, relating to the subject matter hereof.

[*The remainder of this page intentionally left blank; signature pages immediately follow.*]

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed and delivered by their respective officers thereunto duly authorized as of the date first written above.

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON**,
by its authorized representative

By: _____
Name:
Title:

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**, acting by and through the Administrator of the Environmental Protection Agency

By: _____
Name: Michael S. Regan
Title: Administrator

## SCHEDULE I

## WIFIA LOAN SPECIFIC TERMS

| No. | Item | WIFIA Loan Specific Term |
|---|---|---|
| ***PART A.*** | ***Key Borrower Metrics*** | |
| 1. | Effective Date | [___], 2024. |
| 2. | Borrower | City of Sandy, Clackamas County, Oregon, a Legal Entity of the State. |
| 3. | Legal Entity | Municipal corporation. |
| 4. | State | State of Oregon. |
| 5. | Borrower FEIN | 93-6002250. |
| 6. | Borrower UEI | RPCMHNGRWDD1. |
| 7. | Initial Borrower Fiscal Year | The fiscal year of the Borrower commencing on July 1 of any given calendar year and ending on June 30 of the immediately succeeding calendar year. |
| 8. | Application Receipt Date | Application received on January 19, 2022 and amended on October 19, 2023. |
| 9. | WIFIA CUSIP Number | [___], as the CUSIP number for the WIFIA Loan for purposes of monitoring through EMMA. |
| 10. | Wastewater System | The sewer system also referred to as the wastewater system owned and operated by the Borrower (and of which the Project is a part), as more particularly defined below.<br><br>"Wastewater System" means all real and personal property now or hereafter owned, operated, used, or maintained by the Borrower for wastewater disposal or wastewater purification within or without the corporate limits of the Borrower, including but not limited to, all methods of intercepting sewers, diversion sewers, relieving or interconnection sewers, sewers to separate sanitary sewage, pump or ejector stations and equipment, and plants for treatment, processing and disposal of sewage. |
| 11. | Net Revenues | "Net Revenues" means the Gross Revenues less the Operating Expenses.<br><br>"Gross Revenues" means all fees and charges and other revenues that are properly accrued as revenues of the |

| No. | Item | WIFIA Loan Specific Term |
|---|---|---|
| | | Wastewater System, including System Development Charges, under generally accepted accounting principles applicable in the United States of America to the Wastewater System revenues and interest earnings on Gross Revenues. Gross Revenues shall also include transfers out of the Rate Stabilization Account to the Wastewater Fund. However, the term "Gross Revenues" shall not include:<br><br>(a) The interest income or other earnings derived from the investment of the Construction Fund, any amounts set aside for payment of rebates or penalties for Parity Obligations or any escrow fund established for the defeasance or refunding of outstanding indebtedness of the Borrower;<br><br>(b) Any gifts, grants, donations or other moneys received by the Borrower from any Federal agency;<br><br>(c) Any gifts, grants, donations or other moneys received by the Borrower from any State agency or other person (other than any Federal Agency) if such moneys are restricted by law or the grantor to uses inconsistent with the application of Gross Revenues hereunder;<br><br>(d) The proceeds of any borrowing;<br><br>(e) The proceeds of any liability or other insurance (excluding business interruption insurance or other insurance of like nature insuring against the loss of revenues);<br><br>(f) Any ad valorem or other taxes imposed by the Borrower (except charges or payments for Wastewater System services that become "taxes" within the meaning of Article XI, Section 11b of the Oregon Constitution only because they are imposed on property or property owners); and<br><br>(g) Amounts transferred to the Rate Stabilization Account at the option of the Borrower as permitted by Paragraph C.1.H of the Flow of Funds.<br><br>"Operating Expenses" means all costs that are properly treated as expenses of operating and maintaining the Wastewater System under generally accepted accounting |

| No. | Item | WIFIA Loan Specific Term |
|---|---|---|
| | | principles applicable in the United States of America. However, Operating Expenses do not include:<br><br>(a) Any rebates or penalties paid from Gross Revenues under Section 148 of the Code;<br><br>(b) Payments of judgments against the Borrower and payments for the settlement of litigation;<br><br>(c) Non-cash expenses, including depreciation and amortization of property values or losses, and all amounts treated for accounting purposes as payments for capital expenditures;<br><br>(d) Debt service payments, paying agent fees, broker-dealer fees and similar charges for the maintenance of borrowings (including amounts treated for accounting purposes as debt service payments);<br><br>(e) Expenditures allocable to any other funding source that does not constitute Gross Revenues;<br><br>(f) The expenses of owning, operating or maintaining any Separate Utility System;<br><br>(g) Expenditures made from any liability insurance proceeds or from any casualty insurance proceeds used to pay for costs of repairing or replacing portions of the Wastewater System; or<br><br>(h) Expenditures made from grant monies regardless of whether such grant funds are dedicated to a specific purposes or available for the general operation, maintenance and repair or replacement of the Wastewater System. |
| 12. | Trustee | Not Applicable. |
| 13. | Trustee Location | Not Applicable. |
| 14. | [Reserved] | Not Applicable. |

| No. | Item | WIFIA Loan Specific Term |
|---|---|---|
| ***PART B. Key Project Metrics*** | | |
| 15. | Project | The project is a portion of the Sandy Clean Waters Program, which consists of (a) design and planning for a new outfall to the Sandy River, (b) design, planning and construction of facility upgrades to the Borrower's existing wastewater treatment plant, and (c) design, planning, and construction of collection system improvements, located at the Project Location, as described in further detail in **Part D of Schedule II** (*Project Details*). |
| 16. | Project Location | City of Sandy, Clackamas County, Oregon. |
| 17. | Projected Substantial Completion Date | June 30, 2028, as such date may be adjusted in accordance with **Part C of Schedule V** (*Reporting Requirements*). |
| 18. | Development Default Date | June 30, 2030. |
| 19. | NEPA Determination | Categorical Exclusion for the Project issued by EPA on April 4, 2024 in accordance with NEPA. |
| 20. | [Reserved] | Not Applicable. |
| ***PART C. Key Loan Metrics*** | | |
| 21. | Maximum Principal Amount | Principal amount up to $24,738,640 (excluding interest that is capitalized in accordance with this Agreement). |
| 22. | WIFIA Interest Rate | [___]% per annum. |
| 23. | Default Rate | Interest rate equal to the sum of (a) the WIFIA Interest Rate plus (b) 200 basis points. |
| 24. | Interest Payment Date | Each June 1 and December 1, beginning on the Debt Service Payment Commencement Date. |
| 25. | Capitalized Interest Period | The period from (and including) the first Disbursement to (but excluding) the date that is six (6) months prior to the first Payment Date, subject to earlier termination as set forth in Section 8(a)(iii) (*Payment of WIFIA Debt Service*). |
| 26. | Interest Only Period | Not Applicable. |

| No. | Item | WIFIA Loan Specific Term |
|---|---|---|
| 27. | Principal Payment Date | Each June 1 and December 1, beginning on December 1, 2032. |
| 28. | Final Maturity Date | The earliest of (a) [June 1, 2063], (b) the date on which the maturity of the WIFIA Loan and corresponding WIFIA Bond have been accelerated or subject to mandatory redemption or prepayment (as the case may be) prior to maturity thereof; and (c) the Payment Date immediately preceding the date that is thirty-five (35) years following the Substantial Completion Date. |
| 29. | [Reserved] | Not Applicable. |
| ***PART D. Key Security Metrics*** | | |
| 30. | Lien priority | Senior lien *pari passu* with the Liens on the Net Revenues in favor of the Parity Obligations (including, without limitation, the DEQ Obligations). |
| 31. | Springing lien | Not Applicable. |
| 32. | Dedicated revenue source | Net Revenues. |
| 33. | Pledged Collateral | The WIFIA Loan shall be secured by all of the interests of the Borrower in (a) the Net Revenues and (b) the WIFIA Debt Service Reserve Account and all amounts deposited therein or credited thereto from time to time. |
| 34. | System Accounts | The funds and accounts ratified or created pursuant to the WIFIA Loan Documents, including the Wastewater Fund, the WIFIA Debt Service Account, the WIFIA Debt Service Reserve Account, the Rate Stabilization Account, the Subordinate Obligations Account (if created), and all subaccounts established with respect thereto. The Borrower shall maintain the WIFIA Debt Service Account, the WIFIA Debt Service Reserve Account, the Rate Stabilization Account and the Subordinate Obligations Account (if created) as discrete accounts in the Wastewater Fund. |
| 35. | Wastewater Fund | The Wastewater Fund means the collection of funds and accounts that the Borrower uses to hold Gross Revenues prior to their expenditure. |

| No. | Item | WIFIA Loan Specific Term |
|---|---|---|
| 36. | WIFIA Debt Service Account | The separate debt service account established as a discrete account within the Wastewater Fund to secure the WIFIA Loan for the benefit of the WIFIA Lender in accordance with the requirements and conditions set forth in **Annex D** to be used for payments of WIFIA Debt Service by the Borrower. |
| 37. | WIFIA Debt Service Reserve Account | The separate debt service reserve account established as a discrete account within the Wastewater Fund to secure the WIFIA Loan for the benefit of the WIFIA Lender in accordance with the requirements and conditions set forth in **Annex D**. |
| 38. | WIFIA Debt Service Reserve Requirement | The WIFIA Debt Service Reserve Requirement shall be $_____, which is an amount equal to six months of Maximum Annual Debt Service on the WIFIA Loan. The Borrower shall deposit the WIFIA Debt Service Reserve Requirement in the WIFIA Debt Service Reserve Fund no later than the first Payment Date. |
| 39. | Rate Covenant | The rate covenant set forth in **Annex A**. |
| 40. | Additional Parity Obligations Test | The requirements and conditions set forth in **Annex B**. |
| 41. | Flow of Funds | The requirements and conditions specified in **Annex C**. |
| 42. | Rate Stabilization Account; Subordinate Obligations Account | The Rate Stabilization Account established as a discrete account within the Wastewater Fund in accordance with the requirements and conditions set forth in **Annex D**.<br>If created, the Subordinate Obligations Account established as a discrete account within the Wastewater Fund in accordance with the requirements and conditions set forth in **Annex D**. |
| ***PART E. Other Key WIFIA Loan Documents*** | | |
| 43. | WIFIA Bond | The bond issued and delivered by the Borrower in substantially the form of **Exhibit A** (*Form of WIFIA Bond*). |
| 44. | [Reserved] | Not Applicable. |

| No. | Item | WIFIA Loan Specific Term |
|---|---|---|
| 45. | Authorizing Ordinance | That certain Ordinance No. 2024-15, adopted on June 17, 2024, as the same may be amended or supplemented or amended and restated from time to time. |
| 46. | WIFIA Term Sheet | WIFIA term sheet, dated as of the Effective Date, between the Borrower and the WIFIA Lender. |
| 47. | Authorizing Resolution | That certain Resolution No. [_____], adopted on [_____], 2024, as the same may be amended or supplemented or amended and restated from time to time. |
| ***PART F. Fees*** | | |
| 48. | Servicing Set-Up Fee | A servicing set-up fee equal to $12,300. |
| 49. | Construction Period Servicing Fee | An annual construction period servicing fee equal to $12,300. |
| 50. | Initial Construction Period Servicing Fee | The initial Construction Period Servicing Fee in a pro-rated amount equal to $1,020. |
| 51. | Operating Period Servicing Fee | An annual operating period servicing fee equal to $9,220. |
| ***PART G. Borrower Related Notices*** | | |
| 52. | Borrower notice details | City of Sandy<br>39250 Pioneer Blvd<br>Sandy, OR 97055<br>Attention: Finance Department<br>Email: finance@ci.sandy.or.us |
| 53. | [Reserved] | Not Applicable. |

# ANNEX A
# RATE COVENANT

*The following requirements and conditions contained below constitute the Rate Covenant referenced in Part C of Schedule I to this Agreement. Capitalized terms used in this Annex A shall have the respective meanings assigned to such terms in this Agreement or in Annex E to this Agreement.*

**Rate Covenant; Estimated Debt Service Requirement for Balloon Payment**

A.1. The Borrower covenants for the benefit of the WIFIA Lender that it will establish and maintain rates and charges in connection with the Wastewater System that are sufficient to permit the Borrower to pay all Operating Expenses and all lawful charges against the Net Revenues, and to make all transfers required by WIFIA Loan Documents to the WIFIA Debt Service Account, the WIFIA Debt Service Reserve Account and the Subordinate Obligations Account, and to pay all payments required to meet any other obligations of the Borrower that are charges, liens, encumbrances upon, or that are otherwise payable from or expected to be payable from, Gross Revenues or Net Revenues during such Borrower Fiscal Year.

A.2. The Borrower covenants for the benefit of the WIFIA Lender that it shall charge rates and fees in connection with the Wastewater System that, when combined with other Gross Revenues, are adequate to generate:

a) Coverage Revenues each Borrower Fiscal Year at least equal to one hundred fifteen percent (115%) of Annual Debt Service due in that Borrower Fiscal Year.

b) Net Revenues each Borrower Fiscal Year at least equal to one hundred twenty five percent (125%) of Annual Debt Service due in that Borrower Fiscal Year.

A.3. The Borrower shall determine whether it complied with Paragraphs A.1 and A.2 of this Rate Covenant for each Borrower Fiscal Year not later than ninety (90) days after the beginning of the subsequent Borrower Fiscal Year, based on the financial information available to the Borrower at that time, and compliance with Paragraphs A.1 and A.2 of this Rate Covenant shall be determined based on that financial information. A failure to comply with Paragraphs A.1 and A.2 of this Rate Covenant shall not constitute an Event of Default if, within one hundred fifty (150) days after the beginning of the subsequent Borrower Fiscal Year, the Borrower implements the recommendations of a Qualified Consultant that is engaged by the Borrower to deliver written recommendations for a schedule of rates and charges or a reduction of expenses or other actions which the Qualified Consultant reasonably projects will permit the Borrower to comply with Paragraphs A.1 and A.2 of this Rate Covenant by the end of the Borrower Fiscal Year in which the recommendations are delivered to the Borrower (with calculations for the partial year made on an annualized basis).

A.4. The Estimated Debt Service Requirement for a Balloon Payment shall be calculated by the Borrower in accordance with this Paragraph A.4.

A. For the Rate Covenants: For each Balloon Payment that is Outstanding on July 1 of

any Fiscal Year, the Authorized Officer shall prepare a schedule of principal and interest payments for a hypothetical Series of Bonds that refunds that Balloon Payment in accordance with Paragraph A.4.D. The Authorized Officer shall prepare that schedule as of that first day of July, and that schedule shall be used to determine compliance with the rate covenants in Paragraphs A.1 and A.2 of this Rate Covenant for the following Fiscal Year.

B. For Issuance of Additional Parity Obligations: Whenever a Balloon Payment will be Outstanding on the date any Parity Obligations are issued, the Authorized Officer shall prepare a schedule of principal and interest payments for a hypothetical issuance or incurrence of Parity Obligations that refunds each Outstanding Balloon Payment in accordance with Paragraph A.4.D. The Authorized Officer shall prepare that schedule as of the date the Parity Obligations are sold, and that schedule shall be used to determine compliance with the tests for Parity Obligations in Section 6.

C. For the Reserve Requirement: Whenever any Additional Parity Obligations that contains a Balloon Payment and is secured by a debt service reserve fund or account is issued or incurred, the Authorized Officer shall prepare a schedule of principal and interest payments for a hypothetical issuance or incurrence of Parity Obligations that refunds each Balloon Payment in such Additional Parity Obligations in accordance with Paragraph A.4.D. The Authorized Officer shall prepare that schedule as of the date such Additional Parity Obligations are sold, and that schedule shall be combined with the schedule for payment of any debt service on such Additional Parity Obligations that is not a Balloon Payment, and that combined schedule shall be used to determine the reserve requirement as long as such Additional Parity Obligations are Outstanding.

D. Each hypothetical issuance or incurrence of Parity Obligations shall be assumed to be paid in equal annual installments of principal and interest sufficient to amortize the principal amount of the Balloon Payment over the term selected by the Authorized Officer; however, the Authorized Officer shall not select a term that exceeds the lesser of 20 years from the date the Balloon Payment is originally scheduled to be paid or the Borrower's estimate of the remaining weighted average useful life (expressed in years and rounded to the next highest integer) of the assets that are financed with the Balloon Payment. The annual installments shall be assumed to be due on the anniversaries of the date the Balloon Payment is originally scheduled to be paid, with the first installment due on the date the Balloon Payment is scheduled to be paid. The hypothetical issuance or incurrence of Parity Obligations shall be assumed to bear interest at the Authorized Officer's estimate of the average rate that an issuance or incurrence of Parity Obligations would bear if it were amortized as provided in this Paragraph A.4.D and were sold at the time the applicable schedule described in Paragraph A.4.A, Paragraph A.4.B or Paragraph A.4.C is prepared.

# ANNEX B
# ADDITIONAL PARITY DEBT TEST

*The following requirements and conditions contained below constitute the Additional Parity Obligations Test referenced in Part C of Schedule I to this Agreement. Capitalized terms used in this Annex B shall have the respective meanings assigned to such terms in this Agreement or in Annex E to this Agreement.*

**Additional Parity Obligations**

B.1. The Borrower may issue or incur Additional Parity Obligations to provide funds for any purpose relating to the Wastewater System, but only if:

A. No Event of Default under the WIFIA Loan Agreement has occurred and is continuing;

B. At the time of the issuance or incurrence of the Additional Parity Obligations there is no deficiency in any debt service fund for any Parity Obligations, and the balance in any reserve account for any Parity Obligations is at least equal to the applicable reserve requirement;

C. The Parity Obligation Documents authorizing the issuance or incurrence of the Parity Obligations contains a covenant requiring the Borrower to charge rates and fees in connection with the Wastewater System that, when combined with other Gross Revenues, are adequate to satisfy the requirements of Paragraphs A.1 and A.2 of the Rate Covenant; and,

D. There shall have been filed with the Borrower and the WIFIA Lender either:

(i) A certificate of the Authorized Officer stating that both:

(a) the Coverage Revenues (adjusted as provided in Paragraph B.2 of this Additional Parity Obligations Test) for the Base Period were not less than one hundred fifteen percent (115%) of Maximum Annual Debt Service on all then Outstanding Parity Obligations, calculated as of the date the Additional Parity Obligations are issued or incurred and with the proposed Additional Parity Obligations treated as Outstanding; and

(b) the Net Revenues (adjusted as provided in Paragraph B.2 of this Additional Parity Obligations Test) for the Base Period were not less than one hundred twenty five percent (125%) of Maximum Annual Debt Service on all then Outstanding Parity Obligations, calculated as of the date the Additional Parity Obligations are issued or incurred and with the proposed Additional Parity Obligations treated as Outstanding; or

(ii) A certificate or opinion of a Qualified Consultant:

(a) Stating the amount of the Adjusted Net Revenues and the Adjusted Coverage Revenues computed as provided in Paragraph B.3 below for each of the five Borrower Fiscal Years after the last Borrower Fiscal Year for which interest on the Parity Obligations is, or is expected to be, capitalized, or, if interest will not be capitalized, for each of the five Borrower Fiscal Years after the proposed Parity Obligations are issued or incurred;

(b) Concluding that the respective amounts of Adjusted Coverage Revenues in each of the Borrower Fiscal Years described in Paragraph B.1.D(ii)(a) are at least equal to one hundred fifteen percent (115%) of the Annual Debt Service for each of those respective Borrower Fiscal Years on all Outstanding Parity Obligations, with the proposed Parity Obligations treated as Outstanding;

(c) Concluding that the amount of Adjusted Coverage Revenues in the fifth Borrower Fiscal Year described in Paragraph B.1.D(ii)(a) is at least equal to one hundred fifteen percent (115%) of the Maximum Annual Bond Debt Service, calculated for the period beginning with that fifth Borrower Fiscal Year on all then Outstanding Parity Obligations, with the proposed Parity Obligations treated as Outstanding;

(d) Concluding that the respective amounts of Adjusted Net Revenues in each of the Borrower Fiscal Years described in Paragraph B.1.D(ii)(a) are at least equal to one hundred twenty five percent (125%) of the Annual Debt Service for each of those respective Borrower Fiscal Years on all Outstanding Parity Obligations, with the proposed Parity Obligations treated as Outstanding; and

(e) Concluding that the amount of Adjusted Net Revenues in the fifth Borrower Fiscal Year described in Paragraph B.1.D(ii)(a) is at least equal to one hundred twenty five percent (125%) of the Maximum Annual Bond Debt Service, calculated for the period beginning with that fifth Borrower Fiscal Year on all then Outstanding Parity Obligations, with the proposed Parity Obligations treated as Outstanding.

B.2. The Borrower may adjust Coverage Revenues and Net Revenues for purposes of Paragraph B.1.D by adding any Coverage Revenues or Net Revenues the Authorized Officer calculates the Borrower would have had during the Base Period because of increases in Wastewater System rates, fees and charges that have been adopted by the Borrower and are in effect on or before the date the Additional Parity Obligations are issued or incurred. The Borrower shall adjust Coverage Revenues and Net Revenues for the Base Period by eliminating the effect of any withdrawals from or deposits to the Rate Stabilization Account.

B.3. Adjusted Coverage Revenues and Adjusted Net Revenues for purposes of Paragraph B.1.D(ii)

shall be computed by adjusting the Coverage Revenues and Net Revenues for each Borrower Fiscal Year in any of the following ways:

A. To reflect any changes in rates and charges which have been adopted by the Borrower and which are scheduled to take effect during the period described in Paragraph B.1.D(ii)(a) that the Qualified Consultant determines are reasonable; and

B. To reflect any customers added to the Wastewater System after the beginning of the current Borrower Fiscal Year and prior to the date of the Qualified Consultant's certificate; and

C. To reflect any additional Coverage Revenues or Net Revenues not included in the preceding paragraphs that will be derived from improvements, additions and extensions to the Wastewater System that are being financed with the proposed Parity Obligations, or that have been financed with previously issued or incurred Parity Obligations for which the improvements, additions and extensions have not commenced generating revenues.

B.4 The Borrower may issue or incur Additional Parity Obligations to refund Outstanding Parity Obligations without complying with Paragraph B.1 if the refunded Parity Obligations are defeased on the date of delivery of the refunding Additional Parity Obligations and if the Annual Debt Service on the refunding Additional Parity Obligations does not exceed the Annual Debt Service on the refunded Parity Obligations in any Borrower Fiscal Year by more than $5,000.

B.5. All Additional Parity Obligations issued or incurred in accordance with this Section shall have a lien on the Net Revenues that is equal to the lien of all other Outstanding Parity Obligations.

B.6 The Borrower shall not issue or incur any obligations secured on an equal and ratable (*pari passu*) basis with Outstanding Parity Obligations with respect to the lien on the Net Revenues other than pursuant to this Section 6.

# ANNEX C
# FLOW OF FUNDS

*The following requirements and conditions contained below constitute the Flow of Funds referenced in Part C of Schedule I to this Agreement. Capitalized terms used in this Annex C shall have the respective meanings assigned to such terms in this Agreement or in Annex E to this Agreement.*

**Management, Deposit, Pledge and Use of Gross Revenues**

C.1. All Gross Revenues shall be deposited to and maintained in the Wastewater Fund, and shall be used only as described in this Section as long as any Parity Obligations remain Outstanding. The Borrower shall apply Gross Revenues in the Wastewater Fund on or before the following dates for the following purposes in the following order of priority:

A. At any time to pay Operating Expenses which are then due;

B. At least one Business Day prior to each Payment Date, until the date the WIFIA Bond and all of the obligations of the Borrower under this Agreement (other than contingent indemnity obligations) are irrevocably paid in full in immediately available funds and the WIFIA Lender no longer has any commitment to make Disbursements to the Borrower, transfer Net Revenues to the WIFIA Debt Service Account in an amount sufficient (with any other amounts available in the WIFIA Debt Service Account) to pay the interest and the principal coming due on the WIFIA Loan on such Payment Date (whether by virtue of the stated maturity thereof or the mandatory sinking fund redemption). In addition, at least one Business Day prior to each payment date for any other Parity Obligations, transfer Net Revenues at such times as shall be required to pay the principal of and interest on any Parity Obligations in accordance with the provisions of the Parity Obligation Documents. Payments of principal of and interest on the WIFIA Loan and any Parity Obligations shall be made without preference or priority.

C. On the closing date for Parity Obligations and on the day specified in the applicable Parity Obligation Documents, if the balance in any reserve fund for any Parity Obligations is determined to be less than the applicable reserve requirement, to transfer Net Revenues to each such reserve fund for Parity Obligations in the amounts required by the provisions the applicable Parity Obligation Documents until the balances in all reserve funds for Parity Obligations are equal to the applicable reserve requirement.

D. On each date specified in a schedule for funding any reserve fund for any Parity Obligations pursuant to the applicable Parity Obligation Documents, to transfer Net Revenues in the amount specified in such schedule for funding any reserve fund for any Parity Obligations;

E. On the first day of each month following a Valuation Date on which the balance in any reserve fund for any Parity Obligations is determined to be less than the

applicable reserve requirement, to transfer to such reserve fund the amount required by the applicable Parity Obligation Documents;

F. On the day on which any rebates or penalties for Parity Obligations are due to be paid to the United States pursuant to Section 148 of the Code, to pay the amounts due to the United States;

G. On the dates specified in any proceedings authorizing Subordinate Obligations, the Borrower shall transfer to the Subordinate Obligations Account the Net Revenues required by those proceedings, but only if all deposits and payments having a higher priority under this Section have been made, and the Borrower makes a determination that such payments shall not cause or result in, or would likely result in, the occurrence of an Event of Default;

H. On any date, the Borrower may transfer Net Revenues to the Rate Stabilization Account or spend Net Revenues for any other lawful purpose related to the ownership, operation, maintenance or financing of the Wastewater System, but only if all deposits and payments having a higher priority under this Section have been made, and the Borrower makes a determination that such payments shall not cause or result in, or would likely result in, the occurrence of an Event of Default. Any payment of any debt service on FF&C Obligations shall be paid by the Borrower pursuant to this payment priority.

# ANNEX D
# FUNDS AND ACCOUNTS

*The following requirements and conditions contained below constitute additional requirements for the WIFIA Debt Service Account, the WIFIA Debt Service Reserve Account, the Rate Stabilization Fund and the Subordinate Obligations Account. Capitalized terms used in this Annex D shall have the respective meanings assigned to such terms in this Agreement or in Annex E to this Agreement.*

**WIFIA Debt Service Account**

D.1.1. The WIFIA Debt Service Account shall be held by the Borrower. The WIFIA Debt Service Account and any cash and Permitted Investments on deposit therein are pledged to secure the WIFIA Loan for the benefit of the WIFIA Lender and shall be subject to a lien in favor of the WIFIA Lender.

D.1.2. Until the WIFIA Loan is paid in full, amounts in the WIFIA Debt Service Account shall be used only to pay the WIFIA Loan.

D.1.3. The Borrower shall deposit Net Revenues in the WIFIA Debt Service Account as described in Paragraph C.1.B and C.1.C of the Flow of Funds.

D.1.4. Amounts in the WIFIA Debt Service Account shall be invested only in Permitted Investments. Earnings on the WIFIA Debt Service Account shall be credited to the WIFIA Debt Service Account.

**WIFIA Debt Service Reserve Account**

D.2.1. The WIFIA Debt Service Reserve Account shall be held by the Borrower. The WIFIA Debt Service Reserve Account and any cash and Permitted Investments on deposit therein are pledged to secure the WIFIA Loan for the benefit of the WIFIA Lender and shall be subject to a lien in favor of the WIFIA Lender.

D.2.3. Amounts credited to the WIFIA Debt Service Reserve Account shall be used only to pay the WIFIA Loan, and only if Net Revenues credited to other accounts in the Wastewater Fund securing the WIFIA Loan are insufficient.

D.2.3. The Borrower shall deposit an amount equal to the WIFIA Debt Service Reserve Requirement in the WIFIA Debt Service Reserve Account no later than the first Payment Date.

D.2.4. The Borrower shall maintain the WIFIA Debt Service Reserve Account in an amount equal to the WIFIA Debt Service Reserve Requirement, and in furtherance thereof any deficiency therein shall be replenished by the Borrower from Net Revenues pursuant to Paragraph C.1.C of the Flow of Funds.

D.2.5. If, on any Payment Date, the amounts on deposit in the WIFIA Debt Service Account are insufficient to pay all amounts of principal of, premium (if any) and interest on a Series of

Bonds due on such date, then the Borrower shall withdraw from the WIFIA Debt Service Reserve Account in the order of priority set forth below, an amount equal to such deficiency and apply the amount so withdrawn to the payment of the amounts of principal, premium (if any) and interest due on the WIFIA Loan on such date.

Withdrawals from the WIFIA Debt Service Reserve Account shall be made in the following order of priority:

First, from any cash on deposit in the WIFIA Debt Service Reserve Account; and

Second, from the liquidation proceeds of any Permitted Investments made from moneys on deposit in the WIFIA Debt Service Reserve Account.

D.2.6. Transfers to the Reserve Account shall be applied to replenish the balance in the WIFIA Debt Service Reserve Account with cash or Permitted Investments.

D.2.7. If the value of the investments in the WIFIA Debt Service Reserve Account on a Valuation Date exceeds the WIFIA Debt Service Reserve Requirement, the Borrower may transfer the excess to any account of the Wastewater Fund.

D.2.8. Moneys in the WIFIA Debt Service Reserve Account may be invested only in Permitted Investments that mature not later than the date such moneys are required or estimated to be required to be expended hereunder. Earnings on the WIFIA Debt Service Reserve Account shall be credited to such WIFIA Debt Service Reserve Account whenever the balance in the WIFIA Debt Service Reserve Account is less than the WIFIA Debt Service Reserve Requirement. Otherwise earnings shall be credited to the WIFIA Debt Service Account.

D.2.9. Permitted Investments in the WIFIA Debt Service Reserve Account shall be valued on each Valuation Date in the following manner:

(i) Demand deposits, deposits in the Oregon Short Term Fund and investments that mature in two years or less after the Valuation Date shall be valued at their face amount, plus accrued interest;

(ii) Investments that mature more than two years after the Valuation Date and for which bid and asked prices are published on a regular basis by *The Wall Street Journal* (www.wsj.com) (or, if not there, then by *The New York Times* (www.nytimes.com) or another news source that publishes such data) shall be valued at the average of their most recently published bid and asked prices;

(iii) Investments that mature more than two years after the Valuation Date and for which the bid and asked prices are not published on a regular basis by *The Wall Street Journal* (www.wsj.com) or *The New York Times* (www.nytimes.com) of another news source that publishes such data shall be valued at the average bid price quoted by any two nationally recognized government securities dealers (selected by the Borrower in its absolute discretion) at the time making a market in such investments or the bid price published by a nationally recognized pricing service; and

(iv) Certificates of deposit and bankers acceptances that mature more than two years after the Valuation Date shall be valued at their face amount, plus accrued interest.

Any investment that is not specified above and that matures more than two years after the Valuation Date shall be valued at its fair market value as reasonably estimated by the Borrower.

**Rate Stabilization Account**

D.3.1. The Borrower shall maintain the Rate Stabilization Account as long as Parity Obligations are Outstanding. Net Revenues may be transferred to the Rate Stabilization Account at the option of the Borrower as permitted by Paragraph C.1.H of the Flow of Funds. The Borrower may deposit additional lawfully available funds other than Net Revenues to the Rate Stabilization Account. The deposit of such lawfully available funds that are not Net Revenues shall not be considered an Operating Expense. Money in the Rate Stabilization Account may be withdrawn at any time and used for any purpose for which the Gross Revenues may be used. Except as provided in this Section 14(h)(iii), deposits to the Rate Stabilization Account increase Operating Expenses for the Borrower Fiscal Year in which the deposit is made. Withdrawals from the Rate Stabilization Account increase Gross Revenues for the Borrower Fiscal Year in which the withdrawal is made. The Borrower may adjust deposits to and withdrawals from the Rate Stabilization Account for a Borrower Fiscal Year at any time prior to the date on which the audit for that Borrower Fiscal Year is finalized. Earnings on the Rate Stabilization Account shall be credited to the Wastewater Fund.

**Subordinate Obligations Account**

D.4.1.If the Borrower issues Subordinate Obligations, the Borrower shall create and maintain the Subordinate Obligations Account as long as the Subordinate Obligations are outstanding. The Subordinate Obligations Account may be divided into subaccounts, and the Borrower may establish priorities for funding the subaccounts in the Subordinate Obligations Subaccount. Net Revenues shall be deposited into the Subordinate Obligations Account only as permitted by Paragraph C.1.G of the Flow of Funds. Earnings on the Subordinate Obligations Account shall be credited as provided in the proceedings authorizing the Subordinate Obligations.

# ANNEX E
# DEFINITIONS

*Capitalized terms used in Annex A, Annex B and Annex C to the WIFIA Loan Agreement shall have the respective meanings assigned to such terms in the WIFIA Loan Agreement or this Annex E.*

"Adjusted Coverage Revenues" means the Coverage Revenues, adjusted for purposes of Paragraph B.1.D(ii) as provided in Paragraph B.3 of the Additional Parity Obligations Test.

"Adjusted Net Revenues" means the Net Revenues, adjusted for purposes of Paragraph B.1.D(ii) as provided in Paragraph B.3 of the Additional Parity Obligations Test.

"Annual Debt Service" means in any Borrower Fiscal Year the sum of: (1) the amounts of any transfers to any reserve fund for Parity Obligations that are required to be transferred in that Borrower Fiscal Year by Paragraph C.1.C and C.1.D of the Flow of Funds; plus (2) the amount of principal and interest required to be paid in that Borrower Fiscal Year on all Outstanding Parity Obligations, calculated as follows:

(a) Interest that is to be paid from Parity Obligation proceeds shall be subtracted;

(b) Parity Obligations that are subject to scheduled, non-contingent redemption or tender shall be deemed to mature on the dates and in the amounts that are subject to mandatory redemption or tender, and only the amount scheduled to be outstanding on the final maturity date shall be treated as maturing on that date;

(c) Parity Obligations that are subject to contingent redemption or tender shall be treated as maturing on their stated maturity dates; and

(d) Each Balloon Payment shall be assumed to be paid according to its Balloon Debt Service Requirement.

"Authorized Officer" means the City Manager or Deputy City Manager/Finance Director of the Borrower, or any person designated by the City Council to act as "Authorized Officer" under the WIFIA Loan Documents.

"Balloon Debt Service Requirement" means the Committed Debt Service Requirement for a Balloon Payment or, if the Borrower has not entered into a firm commitment to sell Parity Obligations or other obligations to refund that Balloon Payment, the Estimated Debt Service Requirement for that Balloon Payment.

"Balloon Payment" means any principal payment for Parity Obligations that comprises more than twenty-five percent of the original principal amount of an issuance or incurrence of Parity Obligations.

"Base Period" means any twelve consecutive months selected by the Borrower or Qualified Consultant out of the most recent twenty-four months preceding the delivery of such Additional Parity Obligations.

"Bond Counsel" means a law firm having knowledge and expertise in the field of municipal law and whose opinions are generally accepted by purchasers of municipal bonds.

"Code" means the Internal Revenue Code of 1986, as amended, and its applicable rules and regulations.

"Committed Debt Service Requirement" means the schedule of principal and interest payments for Parity Obligations or other obligations that refund a Balloon Payment, as shown in the documents evidencing the Borrower's firm commitment to sell such Parity Obligations. A "firm commitment to sell" means a bond purchase agreement or similar document which obligates the Borrower to sell, and obligates a purchaser to purchase, the refunding Parity Obligations or other obligations, subject only to the conditions that customarily are included in such documents.

"Coverage Revenues" means the Net Revenues less System Development Charges.

"Defeasance Obligations" means direct obligations of the United States, or any non-callable obligations the payment of which is fully and unconditionally guaranteed by the United States.

"Estimated Debt Service Requirement" means the schedule of principal and interest payments for a hypothetical issuance or incurrence of Parity Obligations that refunds a Balloon Payment that is prepared by the Borrower and that meets the requirements of Paragraph A.4 of the Rate Covenant.

"FF&C Obligations" means full faith and credit obligations of the Borrower.

"Fitch" means Fitch Investors Service, Inc., its successors and assigns.

"Fund" means a fund, an account, or an accounting entry that is used to account for revenues under the WIFIA Loan Documents.

"Maximum Annual Debt Service" means the greatest amount of Annual Debt Service that is due in any Borrower Fiscal Year, beginning with the Borrower Fiscal Year for which the calculation is made, and ending with the last Borrower Fiscal Year in which Outstanding Parity Obligations are scheduled to be paid.

"Moody's" means Moody's Investors Service, a corporation organized and existing under the laws of the State of Delaware, its successors and assigns.

"Qualified Consultant" means an independent engineer, an independent auditor, an independent financial advisor, or similar independent professional consultant of nationally recognized standing and having experience and expertise in the area for which such person or firm is retained by the Borrower for purposes of performing activities specified in the WIFIA Loan Documents, and who, or each of whom (a) is in fact independent and not under the domination of the Borrower; (b) does not have any substantial interest, direct or indirect, with the Borrower; and (c) is not connected with the Borrower as a member, officer or employee of the Borrower, but who may be regularly retained to make annual or other reports to the Borrower.

"Rating Agency" means Fitch, Moody's, S&P, or any other nationally recognized financial rating agency that has rated Outstanding Parity Obligations at the request of the Borrower.

"S&P" means Standard & Poor's Corporation, a corporation organized and existing under the laws of the State of New York, its successors and assigns.

"System Development Charges" means one-time fees of the Wastewater System, but only to the extent they are legally permitted to be used to pay the Parity Obligations, charged by the Borrower to new development and certain redevelopment such as additions, and changes of use. These fees are collected to help offset the impact a project will have on the Borrower's existing and planned infrastructure. The fees are authorized pursuant to ORS Chapter 223 and Borrower Code of Ordinances Chapter 15.28 or subsequent statutes and code provisions.

"Valuation Date" means July 1 of each year commencing July 1, ____ (or the first Business Day thereafter, if July 1 is not a Business Day).

## SCHEDULE II

## PROJECT DETAILS

**PART A. Project Budget.**

| SOURCES OF FUNDS | AMOUNT ($ USD) | PERCENTAGE (%) |
|---|---|---|
| WIFIA Loan | $24,738,640 | 79% |
| SRF | $6,631,088 | 21% |
| **Total Sources of Funds** | $31,369,728 | 100% |
| **USES OF FUNDS** | **AMOUNT ($ USD)** | **PERCENTAGE (%)** |
| Construction | $17,661,203 | 56% |
| Design & Planning | $6,358,525 | 20% |
| Program Management | $3,300,000 | 11% |
| Contingency | $3,750,000 | 12% |
| Financing Costs | $300,000 | 1% |
| **Total Uses of Funds** | $31,369,728 | 100% |
| **Total Eligible Project Costs** | $31,369,728 | 100% |
| **Total Project Costs** | $31,369,728 | 100% |

**PART B. Construction Schedule.**

Projected Substantial Completion Date: June 30, 2028

| PROJECT ELEMENT | DESIGN COMPLETION | CONSTRUCTION START | CONSTRUCTION END |
|---|---|---|---|
| Outfall to Sandy River (planning/design only) | 6/30/2028 | N/A | N/A |
| Existing Wastewater Treatment (WWT) Facility Upgrades | 12/18/2026 | 12/21/2026 | 6/30/2028 |
| Collection System Improvements | 12/31/2024 | 4/1/2025 | 6/30/2028 |

**PART C. Existing Construction Contracts.**

| Contract Name | Effective Date | Amount | Parties | Description |
|---|---|---|---|---|
| CM/GC Contract for 2020 Sanitary Sewer Rehabilitation for Inflow and Infiltration Reduction Project, as amended | 11/25/2020 | $7,879,841.10 | The City of Sandy, Oregon and Iron Horse Excavation, LLC DBA Oxbow Construction | Collection System Improvements including the significant rehabilitation of basins 8 and 2 including sewer main rehabilitation, sewer lateral rehabilitation, exterior grouting of manhole structures, construction of new precast concrete manholes, culvert pipe repairs, and emergency repairs. |
| CMGC Contract for 2022 Sanitary Sewer Rehabilitation for Inflow and Infiltration Reduction Project, as amended | 5/23/2022 | $6,069,160.12 | The City of Sandy, Oregon and Iron Horse Excavation, LLC DBA Oxbow Construction | Collection system Improvements include the significant rehabilitation of basins 6 and 7 including sewer main rehabilitation and sewer lateral rehabilitation. |

**PART D. Project Description.**

The project is a portion of the Sandy Clean Waters Program, which consists of (a) design and planning for a new outfall to the Sandy River, (b) design, planning and construction of facility upgrades to the Borrower's existing wastewater treatment plant, and (c) design, planning, and construction of collection system improvements, located at the Project Location, as described in further detail below.

The Project consists of approximately three sub-projects, set out in the table below, that can be categorized into the following groups: Outfall to Sandy River (planning/design only), Existing Wastewater Treatment (WWT) Facility Upgrades and Collection System Improvements.

| [Sub-Project][Project Component] | Name / Description |
|---|---|
| Outfall to Sandy River (planning/design only) | Design and planning activities for a new effluent outfall to the Sandy River, which may include permitting, environmental reviews, hydrologic studies. Deliverable for substantial completion - 90% design and estimate. |
| Existing Wastewater Treatment (WWT) Facility Upgrades | Design, planning and construction of facility upgrades to existing wastewater treatment (WWT) plant - to improve solids separation processes, disinfection, and flow measurements, which may include replacement of rotary screen and grit removal systems, replacement of UV disinfection systems, and replacement of structures used for flow measurement. |
| Collection System Improvements | Design, planning and construction of collection system improvements – to include rehab of Basins 2 and 8 and activities to address Category 4 and 5 structural defects to further reduce infiltration and inflow to the system. |

# SCHEDULE III

# BORROWER DISCLOSURES

## PART A. Existing Indebtedness.

### 1. Parity Obligations

| | |
|---|---|
| **1.** | Clean Water State Revolving Fund Loan Agreement No. R80491 with the State of Oregon acting by and through its Department of Environmental Quality ("DEQ") dated on or about August 1, 2017, as amended January 2, 2019, January 6, 2020, and July 12, 2021, in a final principal amount of $799,425 as may be amended, which is currently outstanding in the principal amount of $359,423, and is secured by the net revenues of the Wastewater System and a separate reserve. |
| **2.** | Clean Water State Revolving Fund Loan Agreement No. R80492 with DEQ dated on or about April 13, 2021, as amended August 24, 2021, in a principal amount of $20,700,000, as may be amended, of which $19,724,339 has been drawn as of the Effective Date and is currently outstanding, with $500,000 expected to be forgiven, and is secured by the net revenues of the Wastewater System and a separate reserve. |
| **3.** | Clean Water State Revolving Fund Loan Agreement No. R80493 with DEQ dated on or about August 2, 2023, in an expected principal amount not to exceed $7,300,000, as may be amended, of which none has been drawn as of the Effective Date, and is secured by the net revenues of the Wastewater System and a separate reserve. |

### 2. Subordinate Obligations

**None.**

**PART B. Litigation Disclosure.**

| No. | Parties | Date Initiated | Description / Status | Venue |
|---|---|---|---|---|
| 1. | United States of America, State of Oregon by and through Department of Environmental Quality, Plaintiffs, v. City of Sandy, Oregon, Defendant | | Case No. 23-cv-968 Consent Decree dated September 11, 2023 | United States District Court for the District of Oregon - Portland Division |

**PART C. Environmental Matter Disclosure.**

| No. | Parties | Date Initiated | Description / Status | Venue |
|---|---|---|---|---|
| 1. | United States of America, State of Oregon by and through Department of Environmental Quality, Plaintiffs, v. City of Sandy, Oregon, Defendant | | Case No. 23-cv-968 Consent Decree dated September 11, 2023 | United States District Court for the District of Oregon - Portland Division |

# SCHEDULE IV

## REQUISITION PROCEDURES

This **Schedule IV** sets out the procedures which the Borrower agrees to follow in submitting Requisitions for any Disbursement of the WIFIA Loan. The Borrower expressly agrees to the terms hereof, and further agrees that (i) the rights of the WIFIA Lender contained herein are in addition to (and not in lieu of) any other rights or remedies available to the WIFIA Lender under the WIFIA Loan Documents, and (ii) nothing contained herein shall be construed to limit the rights of the WIFIA Lender to take actions including administrative enforcement action and actions for breach of contract against the Borrower if it fails to carry out its obligations under this Agreement during the term hereof.

**PART A. General Requirements.**

(a) Manner of Request: All requests by the Borrower for a Disbursement shall be made in writing by electronic submission to the WIFIA Lender, in accordance with Section 31 (*Notices*) of this Agreement.

(b) Required Documentation: Any request by the Borrower should include the submission of:

(i) a Requisition, in the form attached as **Exhibit D** (*Form of Requisition*), completed and executed by the Borrower's Authorized Representative, and otherwise in form and substance satisfactory to the WIFIA Lender; and

(ii) all Eligible Project Costs Documentation that has not otherwise been provided to the WIFIA Lender in accordance with **Part C of Schedule V** (*Reporting Requirements*) of this Agreement.

(c) Timing: Any request for a Disbursement must be received by the WIFIA Lender and the Servicer (if any) at or before 5:00 P.M. (Eastern Time) on either:

(i) the first (1st) Business Day of a calendar month in order to obtain the requested Disbursement by the fifteenth (15th) day of such calendar month; or

(ii) the fifteenth (15th) day of a calendar month, in order to obtain the requested Disbursement by the first (1st) day of the immediately following calendar month;

provided, that, (x) if any such day is not a Business Day, the Disbursement request or payment (as the case may be) shall be made by the next succeeding Business Day; (y) the Borrower shall not request to receive more than one (1) Disbursement per month or every thirty (30) days (whichever is longer); and (z) no Disbursements shall be made after the Final Disbursement Date.

**PART B. WIFIA Lender Review Process**.

(a) The WIFIA Lender shall review the Requisition and the Eligible Project Costs Documentation for compliance with WIFIA Disbursement requirements.

(b) If a Requisition is approved by the WIFIA Lender, the WIFIA Lender will notify the Borrower of such approval and of the amount so approved. A Requisition containing an apparent mathematical error will be corrected by the WIFIA Lender, after telephonic or email notification to the Borrower, and will thereafter be treated as if submitted in the corrected amount. If the amount requested for Disbursement in the Requisition exceeds the available balance of the WIFIA Loan proceeds remaining to be disbursed, the Disbursement request will be treated as if submitted in the amount of the balance so remaining, and the WIFIA Lender will so notify the Borrower.

(c) The WIFIA Lender shall be entitled to withhold approval (in whole or in part) of any pending or subsequent requests for the Disbursement of WIFIA Loan proceeds if: (i) a Default or an Event of Default shall have occurred and be continuing or (ii) the Borrower (1) knowingly takes any action, or omits to take any action, amounting to fraud or violation of any applicable law, in connection with the transactions contemplated hereby; (2) prevents or materially impairs the ability of the WIFIA Lender to monitor compliance by the Borrower with applicable law pertaining to the Project or with the terms and conditions of this Agreement; (3) fails to observe or comply with any applicable law, or any term or condition of this Agreement; (4) fails to satisfy the conditions set forth in Section 4 (*Disbursement Conditions*) and Section 11(b) (*Conditions Precedent to Disbursements*) of this Agreement; or (5) fails to deliver Eligible Project Costs Documentation satisfactory to the WIFIA Lender at the times and in the manner specified by this Agreement; provided, that in such case of sub-clause (5) above, the WIFIA Lender may, in its sole discretion, partially approve a Requisition in respect of any amounts for which adequate Eligible Project Costs Documentation has been provided and may, in its sole discretion, disburse in respect of such properly documented amounts. The WIFIA Lender will notify the Borrower of any withholding, and the reasons therefor.

(d) A Requisition may be rejected in whole or in part by the WIFIA Lender if it is: (i) submitted without signature; (ii) submitted under signature of a Person other than a Borrower's Authorized Representative; (iii) submitted after prior Disbursement of all proceeds of the WIFIA Loan; or (iv) submitted without adequate Eligible Project Costs Documentation. The WIFIA Lender will notify the Borrower of any Requisition so rejected, and the reasons therefor. Any Requisition rejected for the reasons specified under this paragraph (d) must be resubmitted in proper form in order to be considered for approval.

# SCHEDULE V

# REPORTING REQUIREMENTS

## PART A. Updated Financial Model/Plan.

The Borrower shall provide to the WIFIA Lender, not later than one hundred eighty (180) days after the end of each Borrower Fiscal Year, an Updated Financial Model/Plan; provided, that the failure of the Borrower to deliver to the WIFIA Lender an Updated Financial Model/Plan required under this Part A during the period that is one hundred eighty (180) days after the end of the applicable Borrower Fiscal Year shall not constitute a Default or an Event of Default so long as the Borrower provides such Updated Financial Model/Plan within ninety (90) days after the end of such period. The Updated Financial Model/Plan shall reflect the Borrower's reasonable expectations, using assumptions that the Borrower believes to be reasonable, and include: (a) the Borrower's capital improvement plan, major maintenance plan, projected rates and charges, projected debt outstanding and annual debt service, projected Gross Revenues and projected Operating Expenses for a reasonable projection period consistent with the Borrower's operating and financial planning and demonstrating that the Borrower has developed and identified adequate revenues to implement a plan for operating, maintaining, and repairing the Project; (b) evidence of compliance with the Rate Covenant for the most recent Borrower Fiscal Year for which the Borrower's Financial Statements are available and the projected debt service coverage ratios (including projected Rate Covenant coverages) through the Forecast Period; and (c) a written narrative identifying any material changes to the underlying assumptions from the previous Updated Financial Model/Plan.

## PART B. Annual Financial Statements.

The Borrower shall deliver to the WIFIA Lender, as soon as available, but no later than one hundred eighty (180) days after the end of each Borrower Fiscal Year, a copy of the audited income statement and balance sheet of the Borrower as of the end of such Borrower Fiscal Year and the related audited statements of operations and of cash flow of the Borrower for such Borrower Fiscal Year, (a) setting forth in each case in comparative form the figures for the previous fiscal year, (b) certified without qualification or exception, or qualification as to the scope of the audit, by an independent public accounting firm selected by the Borrower and (c) which shall be complete and correct in all material respects and shall be prepared in reasonable detail and in accordance with GAAP applied consistently throughout the periods reflected therein (except, with respect to the annual financial statements, for changes approved or required by the independent public accountants certifying such statements and disclosed therein); provided, that the failure of the Borrower to deliver to the WIFIA Lender the annual audited financial statements required under this Part B during the period that is one hundred eighty (180) days after the end of the applicable Borrower Fiscal Year shall not constitute a Default or an Event of Default so long as the Borrower provides such annual audited financial statements within ninety (90) days after the end of such period; provided, further, that such delivery may be accomplished through the posting of such

annual audited financial statements on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement.

**PART C. Construction Monitoring.**

(a) The WIFIA Lender shall have the right in its sole discretion to monitor (or direct its agents to monitor) the development of the Project, including environmental compliance, design, and construction of the Project. The Borrower shall be responsible for administering construction oversight of the Project in accordance with applicable federal, state and local governmental requirements. The Borrower agrees to cooperate in good faith with the WIFIA Lender in the conduct of such monitoring by promptly providing the WIFIA Lender with such reports, documentation or other information as shall be requested by the WIFIA Lender or its agents, including any independent engineer reports, documentation or information.

(b) Construction Monitoring Report. During the period beginning from the first quarter following bid advertisement of the first Construction Contract for the Project, through and until Substantial Completion of the Project, the Borrower shall furnish to the WIFIA Lender, on a quarterly basis, the Construction Monitoring Report. The report shall be delivered to the WIFIA Lender within thirty (30) days of the end of each such quarter (or if such day is not a Business Day, on the next following Business Day). If the then-current projection for the Substantial Completion Date is a date different than the Projected Substantial Completion Date, the Borrower shall provide in the Construction Monitoring Report a description in reasonable detail to the reasonable satisfaction of the WIFIA Lender of the reasons for such projected delay or difference. The Projected Substantial Completion Date shall automatically be adjusted to the new date specified by the Borrower in the Construction Monitoring Report unless the WIFIA Lender objects to the adjustment in writing to the Borrower within sixty (60) days following receipt of such Construction Monitoring Report on the basis that such report does not demonstrate the matters specified in this paragraph.

(c) Quarterly Certification of Eligible Project Costs. If requested by the WIFIA Lender, on a basis not more frequently than quarterly, the Borrower shall submit to the WIFIA Lender, concurrently with the delivery of the Construction Monitoring Report, a certificate, in the form of **Exhibit E** (*Form of Certification of Eligible Project Costs Documentation*), signed by the Borrower's Authorized Representative, and attaching Eligible Project Costs Documentation as applicable. If there are no applicable Eligible Project Costs for such quarter, the Borrower may notify the WIFIA Lender by written confirmation of the same by email in accordance with Section 31 (*Notices*) of this Agreement. Within sixty (60) days following the receipt of such certificate and accompanying Eligible Project Costs Documentation (if applicable), the WIFIA Lender shall notify the Borrower confirming (i) which Eligible Project Costs incurred by the Borrower set forth in the certification have been approved or denied (and, if denied, the reasons therefor) and (ii) the cumulative amount of Eligible Project Costs that have been approved as of the date of such notice. Any such approved amounts of Eligible Project Costs shall then be deemed to be available for Disbursement at such time as the Borrower submits a Requisition in respect of such approved amounts in accordance with Section 4 (*Disbursement Conditions*).

(d) Final Specifications. The Borrower shall deliver to the WIFIA Lender, prior to bid advertisement for the Project (including each sub-project or component, if applicable), a

copy of the final specifications relating to the development and construction of the Project (or such sub-project or component, as the case may be), demonstrating compliance with all applicable federal requirements and including a summary of the scope of work thereunder.

(e) Modifications. If the Project constitutes a combination of sub-projects and the Borrower reasonably determines that it is necessary or desirable to (a) replace one or more existing sub-projects with one or more new sub-projects or (b) remove one or more existing sub-projects, then the Borrower shall submit a written request to the WIFIA Lender, setting out an explanation for the request, an updated Project description, budget and schedule, and such additional information as may be requested by the WIFIA Lender. Any replacement or removal of a sub-project hereunder shall be consistent with the terms and conditions of this Agreement, in compliance with all applicable laws, and subject to the WIFIA Lender's approval (which approval shall be granted in the WIFIA Lender's sole discretion).

**PART D. Public Benefits Report.**

The Borrower shall deliver to the WIFIA Lender the Public Benefits Report (a) no later than thirty (30) days prior to the Effective Date, (b) within ninety (90) days following the Substantial Completion Date and (c) within ninety (90) days following the fifth ($5^{th}$) anniversary of the Substantial Completion Date. The Borrower agrees that information described in the Public Benefits Report may be made publicly available by the WIFIA Lender at its discretion.

**PART E. Notices.**

(a) The Borrower shall, within fifteen (15) days (or such other time as may be specified below) after the Borrower learns of the occurrence, give the WIFIA Lender notice of any of the following events or receipt of any of the following notices, as applicable, setting forth details of such event:

(i) Substantial Completion: the occurrence of Substantial Completion, such notice to be provided in the form set forth in **Exhibit G** (*Form of Certificate of Substantial Completion*);

(iii) Defaults; Events of Default: any Default or Event of Default;

(iv) Litigation: (1) the filing of any litigation, suit or action, or the commencement of any proceeding, against the Borrower before any arbitrator, Governmental Authority, alternative dispute resolution body, or other neutral third party, that could reasonably be expected to have a Material Adverse Effect, and (2) any final, non-appealable judgment related to the Pledged Collateral that could reasonably be expected to result in the impairment of (A) the Borrower's ability to comply with any of its payment obligations under the WIFIA Bond or this Agreement or (B) the existence, priority or perfection (if applicable) of the WIFIA Lender's security interest in the Pledged Collateral;

(v) Delayed Governmental Approvals: any failure to receive or delay in receiving any Governmental Approval or making any required filing, notice, recordation or other demonstration to or with a Governmental Authority, in each case to the extent such

failure or delay will or could reasonably be expected to result in a delay to any major milestone date (including the Projected Substantial Completion Date) set forth in the Construction Schedule, together with a written explanation of the reasons for such failure or delay and the Borrower's plans to remedy or mitigate the effects of such failure or delay;

(vi) Environmental Notices: any material notice of violation related to the Project or any material change to the Project that could reasonably be expected to affect the NEPA Determination;

(vii) Amendments: except as otherwise agreed by the WIFIA Lender in writing, copies of any fully executed amendments, modifications, replacements or supplements to any Related Document; provided, that such notice may be accomplished through the posting of the relevant documents on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement;

(viii) Related Document Defaults: any material breach or default or event of default on the part of the Borrower or any other party under any Related Document; provided, that such notice may be accomplished through the posting of the relevant documents on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement;

(ix) Uncontrollable Force: the occurrence of any Uncontrollable Force that could reasonably be expected to materially and adversely affect the Project;

(x) Ratings Changes: any change in the rating assigned to the WIFIA Loan or any Obligations, in each case by any Nationally Recognized Rating Agency that has provided a public rating on such indebtedness, and any notices, reports or other written materials (other than those that are ministerial in nature) received from any such rating agencies; provided, that such notice may be accomplished through the posting of the relevant documents on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement;

(xi) 2 C.F.R. § 180.350 Notices: any notification required pursuant to 2 C.F.R. § 180.350, whether attributable to a failure by the Borrower to disclose information previously required to have been disclosed or due to the Borrower or any of its principals meeting any of the criteria set forth in 2 C.F.R. § 180.335;

(xii) Issuance of Obligations: copies of any final issuing instrument (together with any continuing disclosure documents, ordinances, official statement, certifications or cash flow projections in connection therewith), prepared in connection with the incurrence of any Permitted Debt (including any Additional Obligations), together with a confirmation by the Borrower that such additional indebtedness satisfies the applicable requirements under the definition of "Permitted Debt"; provided, that such notice may be accomplished through the posting of the relevant documents on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement;

(xiii) Postings on EMMA: the posting of any document on EMMA in accordance with the requirements of any continuing disclosure agreement or similar document with respect to any Outstanding Obligations relating to annual financial information and operating data and the reporting of significant events; provided, that such notice may be accomplished through the posting of the relevant document on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement;

(xiv) SAM / UEI: any change in the Borrower's SAM registration status (including any exclusions, expiration or inactive registration) or UEI (including any expiration or change in effectiveness); provided, that such notice may be accomplished through the posting of the relevant document on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement;

(xv) Reorganization, Consolidation or Merger: the occurrence of any reorganization, consolidation, or merger, together with the agreements and documents authorizing the reorganization, consolidation or merger; and

(xvi) Fiscal Year: any change to or adoption of any fiscal year other than the Initial Borrower Fiscal Year; provided, that such notice may be accomplished through the posting of the relevant document on EMMA under the WIFIA CUSIP Number with a reference to the relevant WIFIA provision of this Agreement;

(xvii) Draws on WIFIA Debt Service Reserve Account: the occurrence of any draws on the WIFIA Debt Service Reserve Account to fund payments of interest on or principal of the WIFIA Bond when due; and

(xviii) Other Adverse Events: the occurrence of any other event or condition, including without limitation any notice of breach from a contract counterparty or any holder of any Obligations, that could reasonably be expected to result in a Material Adverse Effect.

(b) The Borrower shall, at any time while the WIFIA Loan remains Outstanding, promptly deliver to the WIFIA Lender such additional information regarding the business, financial, legal or organizational affairs of the Borrower or regarding the Wastewater System, the Project, the Gross Revenues or the Net Revenues as the WIFIA Lender may from time to time reasonably request. The Borrower agrees that the delivery of any documents or information under and pursuant to this Agreement shall not be construed as compliance with, or affect in any manner, any obligations of the Borrower under any other contracts, agreements, decrees, Governmental Approvals, or other documents with EPA (other than the WIFIA Loan Documents) or the Federal Government.

# SCHEDULE VI

## WIFIA LOAN AMORTIZATION SCHEDULE

[*To be attached with final interest rate on the Effective Date*]

**EXHIBIT A**

**FORM OF WIFIA BOND**

**CITY OF SANDY, CLACKAMAS COUNTY, OREGON**

**SANDY CLEAN WATERS PROGRAM PROJECT**

**(WIFIA ID – 20126OR)**
**WIFIA BOND**

| Interest Rate | Final Maturity Date | Dated Date | WIFIA CUSIP |
|---|---|---|---|
| [___]%, subject to the Default Rate (as defined and in accordance with the WIFIA Loan Agreement) | June 1, 2063, subject to adjustment as set forth in the WIFIA Loan Agreement | [___] | [___] |

| | |
|---|---|
| **Registered Owner** | **UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, acting by and through the Administrator of the Environmental Protection Agency** |
| **Maximum Principal Amount** | **$24,738,640 (excluding capitalized interest, if any)** |

**CITY OF SANDY, CLACKAMAS COUNTY, OREGON**, a municipal corporation of the State of Oregon (the "**Borrower**"), for value received, hereby promises to pay to the order of the **UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**, acting by and through the Administrator of the United States Environmental Protection Agency, or its assigns (the "**WIFIA Lender**"), the lesser of (x) the Maximum Principal Amount set forth above and (y) the aggregate unpaid principal amount of all Disbursements made by the WIFIA Lender (such lesser amount, together with any interest that is capitalized and added to principal in accordance with the provisions of the WIFIA Loan Agreement (as defined below), being hereinafter referred to as the "**Outstanding Principal Sum**"), together with accrued and unpaid interest (including, if applicable, interest at the Default Rate, as defined in the WIFIA Loan Agreement (as defined below)) on the Outstanding Principal Sum and all fees, costs and other amounts payable in connection therewith, all as more fully described in that certain WIFIA Loan Agreement, dated as of the date hereof, between the WIFIA Lender and the Borrower (the "**WIFIA Loan Agreement**"). All capitalized terms used in this WIFIA Bond and not defined herein shall have the meanings set forth in the WIFIA Loan Agreement.

The WIFIA Debt Service hereof shall be payable in the amounts, manner and on the Payment Dates as set forth in the WIFIA Loan Amortization Schedule in accordance with the WIFIA Loan Agreement (which WIFIA Loan Amortization Schedule may be revised from time to time in accordance with the WIFIA Loan Agreement), until paid in full (which Loan Amortization Schedule, as modified from time to time in accordance with the terms of the WIFIA Loan Agreement, is incorporated in and is a part of this WIFIA Bond). The WIFIA Lender is hereby authorized to modify the WIFIA Loan Amortization Schedule from time to time to reflect the amount of each Disbursement made thereunder and the date and amount of principal or interest paid by the Borrower thereunder and otherwise in accordance with the terms of the WIFIA Loan Agreement. Absent manifest error, the WIFIA Lender's determination of such matters as set forth on the WIFIA Loan Amortization Schedule to the WIFIA Loan Agreement shall be conclusive evidence thereof; provided, however, that neither the failure to make any such recordation nor any error in such recordation shall affect in any manner the Borrower's obligations hereunder or under any other WIFIA Loan Document.

Payments hereon are to be made in accordance with Section 8(b) (*Manner of Payment*) and Section 31 (*Notices*) of the WIFIA Loan Agreement as the same become due. Principal of and interest on this WIFIA Bond shall be made in Dollars and in immediately available funds (without counterclaim, offset or deduction). Any payment in respect of the WIFIA Bond shall be treated as a payment in respect of the WIFIA Loan and any prepayment of principal in respect of the WIFIA Loan shall be treated as a redemption in respect of the WIFIA Bond. If the Final Maturity Date is adjusted in accordance with the WIFIA Loan Agreement, the due date of this WIFIA Bond shall be deemed to be amended to change the due date to such revised Final Maturity Date without any further action required on the part of the Borrower or the WIFIA Lender and such amendment shall in no way amend, modify or affect the other provisions of this WIFIA Bond without the prior written agreement of the WIFIA Lender. Any such amendment shall be reflected in a revised Loan Amortization Schedule.

This WIFIA Bond has been executed under and pursuant to the WIFIA Loan Documents and is issued to evidence the obligation of the Borrower under the WIFIA Loan Documents to repay the loan made by the WIFIA Lender and any other payments of any kind required to be paid by the Borrower under the WIFIA Loan Agreement or the other WIFIA Loan Documents referred to therein. Reference is made to the WIFIA Loan Agreement for all details relating to the Borrower's obligations hereunder.

Payment of the obligations of the Borrower under this WIFIA Bond is secured pursuant to the WIFIA Loan Documents. The Lien on the Pledged Collateral securing this WIFIA Bond for the benefit of the WIFIA Lender is (i) on a parity in right of payment and right of security to the Lien on the Net Revenues in favor of the Parity Obligations and (b) senior in right of payment and right of security to the Lien on the Net Revenues in favor of the Subordinate Obligations.

This WIFIA Bond may be prepaid at the option of the Borrower in whole or in part (and, if in part, the principal installments and amounts thereof to be prepaid are to be determined in accordance with the WIFIA Loan Agreement; provided, however, such prepayments shall be in principal amounts of at least $500,000 or any integral multiple of $1.00 in excess thereof), without penalty or premium, and otherwise in accordance with the WIFIA Loan Agreement.

Any delay on the part of the WIFIA Lender in exercising any right hereunder shall not operate as a waiver of any such right, and any waiver granted with respect to one default shall not operate as a waiver in the event of any subsequent default.

All acts, conditions and things required by the Constitution and laws of the State to happen, exist, and be performed precedent to and in the issuance of this WIFIA Bond have happened, exist and have been performed as so required. This WIFIA Bond is issued with the intent that the federal laws of the United States of America shall govern its construction to the extent such federal laws are applicable and the internal laws of the State shall govern its construction to the extent such federal laws are not applicable.

IN WITNESS WHEREOF, CITY OF SANDY, CLACKAMAS COUNTY, OREGON has caused this WIFIA Bond to be executed in its name and its seal to be affixed hereto and attested by its duly authorized officer, all as of the Effective Date set forth above.

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON,**
by its authorized representative

(SEAL)

By:_____
Name:
Title:

ATTEST:

By:_____
Name:
Title:

(FORM OF ASSIGNMENT)

FOR VALUE RECEIVED, the Undersigned hereby unconditionally sells, assigns and transfers unto

(*Please Insert Social Security or other identifying number of Assignee(s)*):

the within WIFIA Bond and all rights thereunder.

Dated: _____

NOTICE: The signature to this assignment must correspond with the name as it appears upon the face of the within note in every particular, without alteration or enlargement or any change whatever.

# EXHIBIT B

## FORM OF CLOSING CERTIFICATE

Reference is made to that certain WIFIA Loan Agreement, dated as of [_____], 2024 (the "**WIFIA Loan Agreement**"), by and among the City of Sandy, Clackamas County, Oregon (the "**Borrower**") and the United States Environmental Protection Agency, acting by and through the Administrator (the "**WIFIA Lender**"). Capitalized terms used in this certificate and not defined herein shall have the respective meanings ascribed to such terms in the WIFIA Loan Agreement.

In connection with Section 11(a) (*Conditions Precedent to Effectiveness*) of the WIFIA Loan Agreement, the undersigned, as the Borrower's Authorized Representative, does hereby certify on behalf of the Borrower and not in his/her personal capacity, as of the date hereof:

(a) pursuant to Section 11(a)(v) of the WIFIA Loan Agreement, attached hereto as Annex A is an incumbency certificate that lists all persons, together with their positions and specimen signatures, who are duly authorized by the Borrower to execute the WIFIA Loan Documents to which the Borrower is or will be a party, and who have been appointed as a Borrower's Authorized Representative in accordance with Section 21 (*Borrower's Authorized Representative*) of the WIFIA Loan Agreement;

(b) pursuant to Section 11(a)(i) of the WIFIA Loan Agreement, the Borrower has delivered to the WIFIA Lender copies of the WIFIA Loan Agreement and the WIFIA Bond, and each such document is complete, fully executed, and in full force and effect;

(c) pursuant to Section 11(a)(i) of the WIFIA Loan Agreement, the Borrower has delivered to the WIFIA Lender copies of the Authorizing Ordinance and the Authorizing Resolution, each of which has been duly adopted by the City Council of the Borrower and is in full force and effect;

(d) pursuant to Section 11(a)(ii) of the WIFIA Loan Agreement, the Borrower has delivered to the WIFIA Lender copies of (A) any Parity Obligation Documents and (B) any Other Financing Document with respect to which all or a portion of the proceeds are or will be applied to fund all or any portion of Total Project Costs that has been entered into on or prior to the Effective Date, and each such document is complete, fully executed, and in full force and effect, and all conditions contained in the Related Documents that are necessary to the closing of the WIFIA transaction contemplated hereby (if any) have been fulfilled;

(c) pursuant to Section 11(a)(v)(A) of the WIFIA Loan Agreement, (i) the Maximum Principal Amount, together with the amount of any other credit assistance provided under the Act to the Borrower, does not exceed eighty percent (80%) of reasonably anticipated Eligible Project Costs; (ii) the aggregate amount of Eligible Project Costs previously incurred prior to the Effective Date does not exceed fifty-one percent (51%) of Eligible Project Costs; and (iii) the total federal assistance

provided to the Project, including the Maximum Principal Amount, does not exceed eighty percent (80%) of Total Project Costs;

(d) pursuant to Section 11(a)(v)(B) of the WIFIA Loan Agreement, the Borrower is in compliance with NEPA and any applicable federal, state or local environmental review and approval requirements with respect to the Project;

(e) pursuant to Section 11(a)(v)(C) of the WIFIA Loan Agreement, the Borrower has (i) obtained a FEIN, as evidenced by the Borrower's W-9 which is included in the closing transcripts for the WIFIA Loan, and a UEI, in each case as set forth on Part A of Schedule I (*WIFIA Loan Specific Terms*) to the WIFIA Loan Agreement, and (ii) registered with SAM, and obtained confirmation of active SAM registration status with no exclusions, which confirmation is included in the closing transcripts for the WIFIA Loan;

(f) pursuant to Section 11(a)(v)(D) of the WIFIA Loan Agreement, the Borrower has obtained the WIFIA CUSIP Number, as set forth on Part A of Schedule I (*WIFIA Loan Specific Terms*) to the WIFIA Loan Agreement, and which confirmation is included in the closing transcripts for the WIFIA Loan;

(g) pursuant to Section 11(a)(v)(E) of the WIFIA Loan Agreement, the representations and warranties of the Borrower set forth in the WIFIA Loan Agreement and in each other WIFIA Loan Document to which the Borrower is a party are true and correct on and as of the date hereof, except to the extent that such representations and warranties expressly relate to an earlier date, in which case such representations and warranties were true and correct as of such earlier date;

(h) pursuant to Section 11(a)(v)(F) of the WIFIA Loan Agreement, no Material Adverse Effect, or any event or condition that could reasonably be expected to have a Material Adverse Effect, has occurred or arisen since the date of the Application;

(i) pursuant to Section 11(a)(v)(G) of the WIFIA Loan Agreement, upon the issuance of the WIFIA Bond and the incurrence of the WIFIA Loan, the Borrower is in compliance with all requirements and conditions set forth in the Parity Obligation Documents in effect as of the Effective Date with respect to the parity status of the WIFIA Bond and attached hereto is evidence demonstrating such compliance;

(j) pursuant to Section 11(a)(vi) of the WIFIA Loan Agreement, the rating evidenced by the rating letter delivered to the WIFIA Lender pursuant to such Section 11(a)(vi) has not been reduced, withdrawn or suspended as of the Effective Date; and

(k) pursuant to Section 11(a)(ix) of the WIFIA Loan Agreement, the Borrower has delivered to the WIFIA Lender copies of all consents that are required from (A) Clackamas County Bank under the Business Loan Agreement in effect as of the Effective Date and (B) the State, acting by and through its Department of Environmental Quality, under the DEQ Obligation Documents in effect as of the Effective Date, for the incurrence of the WIFIA Loan and the issuance of the

WIFIA Bond pursuant to the WIFIA Loan Documents, and each such consent is complete, fully executed, and in full force and effect.

[*The remainder of this page intentionally left blank; signature page immediately follows.*]

IN WITNESS WHEREOF, the undersigned has executed this certificate as of the date first mentioned above.

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON,**
by its authorized representative

By: _____
Name:
Title:

[*Signature Page to City of Sandy – Sandy Clean Waters Program Project – Closing Certificate*]

**ANNEX A TO EXHIBIT B**

**INCUMBENCY CERTIFICATE**

The undersigned certifies that he/she is the City Recorder of City of Sandy, Clackamas County, Oregon, a municipal corporation, (the "**Borrower**"), and as such he/she is authorized to execute this certificate and further certifies that the following persons have been elected or appointed, are qualified, and are now acting as officers or authorized persons of the Borrower in the capacity or capacities indicated below, and that the signatures set forth opposite their respective names are their true and genuine signatures. He/She further certifies that any of the officers listed below is authorized to sign agreements and give written instructions with regard to any matters pertaining to the WIFIA Loan Documents as the Borrower's Authorized Representative (each as defined in that certain WIFIA Loan Agreement, dated as of the date hereof, between the Borrower and the United States Environmental Protection Agency, acting by and through the Administrator):

| Name | Title | Signature |
|---|---|---|
| [_____] | [_____] | _____ |
| [_____] | [_____] | _____ |
| [_____] | [_____] | _____ |
| [_____] | [_____] | _____ |
| [_____] | [_____] | _____ |

IN WITNESS WHEREOF, the undersigned has executed this certificate as of this _____ day of [___], 2024.

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON,**,
by its authorized representative

By: _____
Name:
Title:

# EXHIBIT C

## FORM OF PUBLIC BENEFITS REPORT

Pursuant to [Section 11(a)(vii)) and] Part D of Schedule V (*Reporting Requirements*) of the WIFIA Loan Agreement (as defined below), City of Sandy, Clackamas County, Oregon (the "**Borrower**") is providing this Public Benefits Report in connection with the Sandy Clean Waters Program Project (WIFIA ID – 20126OR). Capitalized terms used in this certificate and not defined shall have the respective meanings ascribed to such terms in the WIFIA Loan Agreement dated [on or about the date hereof][___] (the "**WIFIA Loan Agreement**"), between the Borrower and the United States Environmental Protection Agency, acting by and through the Administrator.

**Reporting Period:** [Prior to the Effective Date][within ninety (90) days following the Substantial Completion Date][within ninety (90) days following the fifth ($5^{th}$) anniversary of the Substantial Completion Date]

**(i) The number of total jobs and direct jobs projected to be created by the Project during the period between the Effective Date and the Substantial Completion Date:**

WIFIA projects that the Project will create 79 total jobs.

**(ii) Indicate (yes or no) whether the Project will assist the Borrower in complying with applicable regulatory requirements, and if yes, describe how the project assists with regulatory compliance:**

Yes **X**
If yes, additional description: Improvements to conveyance system will minimize occurrence of sewer overflows in collection system and an investment in treatment plant infrastructure will enable compliance with current NPDES regulations.

No ☐

**(iii) The Project will assist the Borrower with the following environmental measure:**

Measure(s):

Amount by which Project will provide new, expanded, improved, more reliable, more resilient, or more efficient treatment capacity for wastewater treatment (measured in MGD capacity at Substantial Completion).

Value: 9.9 MGD

# EXHIBIT D

## FORM OF REQUISITION

**VIA EMAIL**
United States Environmental Protection Agency[1]
1200 Pennsylvania Avenue NW
WJC-E 7334A
Washington, D.C. 20460
Attention: WIFIA Director
Email: WIFIA_Portfolio@epa.gov

Re: Sandy Clean Waters Program Project (WIFIA ID – 20126OR)

Ladies and Gentlemen:

Pursuant to Section 4 (*Disbursement Conditions*) and Schedule IV (*Requisition Procedures*) of the WIFIA Loan Agreement, dated as of [*date*], 2024 (the "**WIFIA Loan Agreement**"), by and between CITY OF SANDY, CLACKAMAS COUNTY, OREGON (the "**Borrower**") and the UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, acting by and through the Administrator (the "**WIFIA Lender**"), the Borrower hereby requests a Disbursement in the amount set forth below in respect of Eligible Project Costs paid or incurred by the Borrower. Capitalized terms used but not defined herein have the meaning set forth in the WIFIA Loan Agreement.

In connection with this Requisition, the undersigned, as the Borrower's Authorized Representative, hereby represents and certifies the following:

| | | |
|---|---|---|
| 1. | **Project name** | Sandy Clean Waters Program Project |
| 2. | **Borrower name** | City of Sandy, Clackamas County, Oregon |
| 3. | **WIFIA Loan ID** | 20126OR |
| 4. | **Borrower UEI** | RPCMHNGRWDD1 |
| 5. | **Borrower FEIN number** | 93-6002250 |
| 6. | **Requisition number** | [___] |
| 7. | **Requested Disbursement amount** | $[___] |
| 8. | **Requested date of Disbursement (the "Disbursement Date")**[2] | [___] |
| 9. | **Total amounts previously disbursed under the WIFIA Loan Agreement** | $[___] |
| 10. | **Wire or ACH transfer instructions (please specify method)** | [___] |

[1] If there is a Servicer for the WIFIA Loan, provide a copy to the Servicer as well and include its notice details here.
[2] Note this should be the actual disbursement date on which the Borrower requests to receive the funds, not the date that this Requisition form is submitted to the WIFIA Lender.

11. As of the date hereof, and immediately after giving effect to the Disbursement of WIFIA Loan proceeds requested under this Requisition, (a) no Default or Event of Default and no event of default under any other Related Document shall have occurred and be continuing and (b) no event that, with the giving of notice or the passage of time or both, would constitute an event of default under any other Related Document, shall have occurred and be continuing.

12. No Material Adverse Effect, or any event or condition that could reasonably be expected to have a Material Adverse Effect, has occurred since the Effective Date.

13. The aggregate amount of all Disbursements (including the requested Disbursement amount under this Requisition but excluding any interest that is capitalized in accordance with the WIFIA Loan Agreement) does not exceed (a) the Maximum Principal Amount or (b) the amount of Eligible Project Costs paid or incurred by the Borrower.

14. The Eligible Project Costs for which reimbursement or payment is being requested has not been reimbursed or paid by any previous disbursement of (a) WIFIA Loan proceeds or (b) any other source of funding for the Project as identified in the Project Budget.

15. The Borrower, and, to the best of its knowledge, each of its contractors and subcontractors at all tiers with respect to the Project, has complied with all applicable laws, rules, regulations and requirements, including 40 U.S.C. §§3141-3144, 3146, and 3147 (relating to Davis-Bacon Act requirements) (and regulations relating thereto) and 33 U.S.C. §3914 (relating to American iron and steel products). Supporting documentation, such as certified payroll records and certifications for all iron and steel products used for the Project, are being maintained and are available for review upon request by the WIFIA Lender.

16. The representations and warranties of the Borrower set forth in the WIFIA Loan Agreement and in each other WIFIA Loan Document are true and correct as of the date hereof and as of the Disbursement Date, except to the extent such representations and warranties expressly relate to an earlier date (in which case, such representations and warranties are true and correct as of such earlier date).

17. The Borrower has delivered all required deliverables under and in compliance with the requirements of Schedule V (*Reporting Requirements*), except as has been otherwise agreed by the WIFIA Lender.[3]

18. The amount hereby being requested for Disbursement is with respect to Eligible Project Costs for which [all][a portion][none] of the Eligible Project Costs Documentation was previously submitted to and approved by the WIFIA Lender in accordance with Schedule IV (*Requisition Procedures*) and Schedule V (*Reporting Requirements*) of the WIFIA Loan Agreement. The [following table below][attached excel sheet] sets out a summary of any

[3] The most recent quarterly progress report should set out a summary of the progress of construction of the Project, as well as a general description of the work done for which the funds being requisitioned are being applied and a summary of any material changes/risks. If not, PM should request additional information (including a risk register, if applicable).

Eligible Project Costs that have not otherwise been previously submitted to the WIFIA Lender for approval, and supporting Eligible Project Costs Documentation in respect of such new Eligible Project Costs is attached hereto. [4]

| | | | | | | | | WIFIA USE ONLY | |
|---|---|---|---|---|---|---|---|---|---|
| **Vendor or Contractor Name[5]** | **Invoice Number[6]** | **Invoice Date** | **Payment Date** | **Invoice Amount** | **WIFIA Requested Amount[7]** | **Activity Type[8]** | **Description of Activity[9]** | **Approved Amount** | **Notes** |
| | | | | | | | | | |

The undersigned acknowledges that if the Borrower makes a false, fictitious, or fraudulent claim, statement, submission, or certification to the Government in connection with the Project, the Government reserves the right to impose on the Borrower the penalties of 18 U.S.C. § 1001, to the extent the Government deems appropriate.

Date: _____

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON,**,
by its authorized representative

By: _____
Name:
Title:_____

[4] See Schedules IV, V and Exhibit E of the WIFIA Loan Agreement for additional details on EPC Documentation.
[5] If seeking reimbursement for internal costs, enter "Internally financed activities."
[6] Vendor's number indicated on the invoice sent to the Borrower.
[7] If the amount requested for reimbursement by the WIFIA Lender is less than the total amount of the invoice, include an explanation for the difference.
[8] Specify whether activity is: (a) **Development phase activity**, which includes planning, preliminary engineering, design, environmental review, revenue forecasting and other pre-construction activities; (b) **Construction**, which includes construction, reconstruction, rehabilitation and replacement activities; (c) **Acquisition of real property**, which includes acquiring an interest in real property, environmental mitigation, construction contingencies and acquisition of equipment; (d) **Carrying costs**, including capitalized interest, as necessary to meet market requirements, reasonably required reserve funds, capital issuance expenses and other carrying costs during construction; (e) **WIFIA fees**, including for application and credit processing; or (f) **Other**, with an explanation in the "Description of Activity" column.
[9] Provide a brief description of the activities included in the invoice for which WIFIA funds are being requested and any other notes that will aid in the review of the disbursement request.

# EXHIBIT E

## FORM OF CERTIFICATION OF ELIGIBLE PROJECT COSTS DOCUMENTATION

**VIA EMAIL**
United States Environmental Protection Agency[1]
1200 Pennsylvania Avenue NW
WJC-E 7334A
Washington, D.C. 20460
Attention: WIFIA Director
Email: WIFIA_Portfolio@epa.gov

Re: Sandy Clean Waters Program Project (WIFIA ID – 20126OR)

Ladies and Gentlemen:

Pursuant to Part C of Schedule V (*Reporting Requirements*) of the WIFIA Loan Agreement, dated as of [*date*], 2024 (the "**WIFIA Loan Agreement**"), by and between CITY OF SANDY, CLACKAMAS COUNTY, OREGON (the "**Borrower**") and the UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, acting by and through the Administrator (the "**WIFIA Lender**"), the Borrower hereby presents this certificate in connection with the Borrower's delivery of Eligible Project Costs Documentation to the WIFIA Lender. Capitalized terms used but not defined herein have the meaning set forth in the WIFIA Loan Agreement.

The undersigned does hereby represent and certify the following:

1. This certificate is being delivered to the WIFIA Lender in connection with the Eligible Project Costs during the period between [___] and [___] (the "**Quarterly Period**").

2. A summary of the Eligible Project Costs incurred, invoiced and/or paid (as the case may be) is set out in the [attached excel sheet][table on the following page:]

[1] If there is a Servicer for the WIFIA Loan, provide a copy to the Servicer as well and include its notice details here.

| | | | | | | | WIFIA USE ONLY | |
|---|---|---|---|---|---|---|---|---|
| **Vendor or Contractor Name[2]** | **Invoice Number[3]** | **Invoice Date** | **Payment Date** | **Invoice Amount** | **Activity Type[4]** | **Description of Activity[5]** | **Approved Amount** | **Notes** |
| | | | | | | | | |

3. The anticipated sources of funding for such Eligible Project Costs are [listed below][set forth in the attached excel sheet].

4. Supporting Eligible Project Costs Documentation for the above Eligible Project Costs for the Quarterly Period are also attached hereto.[6]

5. The most recently delivered Construction Monitoring Report delivered in accordance with Part C of Schedule V (*Reporting Requirements*) sets out a summary of the progress of construction of the Project, no change has occurred since the date of such Construction Monitoring Report that could reasonably be expected to cause a Material Adverse Effect, and the Borrower is otherwise in compliance with Part C of Schedule V (*Reporting Requirements*).

Date: _____

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON,** [7]

By: _____
Name:
Title:_____

[2] If the expectation is to seek reimbursement for internal costs, enter "Internally financed activities."
[3] Vendor's number indicated on the invoice sent to the Borrower.
[4] Specify whether activity is: (a) **Development phase activity**, which includes planning, preliminary engineering, design, environmental review, revenue forecasting and other pre-construction activities; (b) **Construction**, which includes construction, reconstruction, rehabilitation and replacement activities; (c) **Acquisition of real property**, which includes acquiring an interest in real property, environmental mitigation, construction contingencies and acquisition of equipment; (d) **Carrying costs**, including capitalized interest on other Project Obligations during construction, as necessary to meet market requirements, reasonably required reserve funds, capital issuance expenses and other carrying costs during construction; (e) **WIFIA fees**, including for application and credit processing; or (f) **Other**, with an explanation in the "Description of Activity" column.
[5] Provide a brief description of the activities included in the invoice for which WIFIA funds are being requested and any other notes that will aid in the review of the documentation.
[6] See Schedules IV and V of the WIFIA Loan Agreement for additional details on EPC Documentation.
[7] To be executed by the Borrower's Authorized Representative.

# EXHIBIT F

## FORM OF CONSTRUCTION MONITORING REPORT

**VIA EMAIL**
United States Environmental Protection Agency
1200 Pennsylvania Avenue NW
WJC-E 7334A
Washington, DC 20460
Attn: WIFIA Director
Email: WIFIA_Portfolio@epa.gov

Re: Sandy Clean Waters Program Project (WIFIA ID – 20126OR)

This Construction Monitoring Report for the period of [*insert relevant quarterly period*] (the "**Quarterly Period**") is provided pursuant to Part D of Schedule V (*Reporting Requirements*) of the WIFIA Loan Agreement, dated as of [*date*], 2024 (the "**WIFIA Loan Agreement**"), by and between CITY OF SANDY, CLACKAMAS COUNTY, OREGON (the **"Borrower**") and the UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, acting by and through the Administrator of the Environmental Protection Agency (the "**WIFIA Lender**"). Unless otherwise defined herein, all capitalized terms in this Construction Monitoring Report have the meanings assigned to those terms in the WIFIA Loan Agreement.

1. **Project Status**. Provide a narrative summary of the Project's construction progress during the Quarterly Period, including with respect to the Project components or sub-projects where appropriate. Complete the table in Appendix A to update the Project scope, schedule, and costs with the latest information.

2. **Current Projected Substantial Completion Date**:

   If the current Projected Substantial Completion Date differs than the date set forth in the Construction Monitoring Report most recently delivered to the WIFIA Lender (or, if no such report has yet been provided, the date of the Projected Substantial Completion Date set forth in the WIFIA Loan Agreement as of the Effective Date), provide a description in reasonable detail for such projected delay or difference:

3. **Material Problems (if any)**

   Note any problems encountered or anticipated during the construction of the Project during the Quarterly Period that (1) impedes Project completion within the scope, costs,

and schedule outlined in the WIFIA Loan Agreement or (2) relates to unforeseen complications in connection with the construction of the Project. This may include commissioning/start-up issues, constructability issues for the Project as planned, adverse impacts to Project surroundings, changes in or issues with meeting environmental or federal compliance requirements, and unanticipated or abnormal permit approval timelines. Include an assessment of the impact and any current plans to address the problems.

| |
|---|
| |

**4. Other Matters Related to the Project (if applicable)**

| |
|---|
| |

Date: _____

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON,**

By: _____
Name: _____
Title:_____

# APPENDIX A [1]

| Project Scope | | Project Schedule | | | | | | Project Costs | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Project Component | Completed (Y/N) | Contract/ Vendor | Bid Advertisement Date | Contract Award Date | NTP Effective Date | Original Substantial Completion Date | Estimated Substantial Completion Date | Original Contract Amount | Estimated Costs to Complete | Costs Earned or Paid to Date |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Total | | | | | | | | | | |

**Table Definitions:**
Project Component – project name or ID as tracked by the borrower
Complete (Y/N) – indication that project is complete, and no additional updates will be provided
Description (program of projects only) – brief overview of scope of work for the project component.
Location (program of projects only) – physical project boundaries
Covered by existing NEPA? (program of projects only) – refer to the environmental review documents that is the basis for the NEPA finding. Is the project within the geographic scope and scope of activities described in the documents?

Contract/Vendor – the contract identifier and contractor that is/will be completing the project construction.
Bid Advertisement Date – the date the bid was advertised
Contract Award date – the date the contract was awarded
NTP Effective date – the effective date to proceed with the construction in the Notice to Proceed
Original Substantial Completion Date – the substantial completion date for the given project as noted in the original contract award
Estimated Substantial Completion Date – the latest date estimate for substantial completion for the given project component

Original Contract Amount – the original contract award amount
Estimated Costs to Complete – the latest cost estimates to complete the given project component
Costs Earned or Paid to Date – the latest incurred contract costs for the given project component
Total – Total the cost amounts across all project components and contracts

[1] Appendix A summarizes all project components that will be bid in the next quarter, are currently under construction, or have completed construction. It should be a cumulative list of projects that is updated each quarter. A Microsoft Excel spreadsheet with similar table format is acceptable.

# EXHIBIT G

## FORM OF CERTIFICATE OF SUBSTANTIAL COMPLETION

[*Letterhead of Borrower*]

[*Date*]

**VIA EMAIL**
United States Environmental Protection Agency
1200 Pennsylvania Avenue NW
WJC-E 7334A
Washington, DC 20460
Attn: WIFIA Director
Email: WIFIA_Portfolio@epa.gov

**Project:** Sandy Clean Waters Program Project (WIFIA ID – 20126OR)

Dear Director:

This Notice is provided pursuant to Part E of Schedule V (*Reporting Requirements*) of that certain WIFIA Loan Agreement (the "**WIFIA Loan Agreement**"), dated as of [*date*], 2024, by and between CITY OF SANDY, CLACKAMAS COUNTY, OREGON (the "**Borrower**") and the UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, acting by and through its Administrator (the "**WIFIA Lender**").

Unless otherwise defined herein, all capitalized terms in this certificate have the meanings assigned to those terms in the WIFIA Loan Agreement.

I, the undersigned, in my capacity as the Borrower's Authorized Representative and not in my individual capacity, do hereby certify to the WIFIA Lender that:

(a) the Project has satisfied each of the requirements for Substantial Completion set forth in the Construction Contracts;

(b) Substantial Completion has been declared under each of the relevant Construction Contracts and copies of the notices of Substantial Completion under such agreements are attached to this certification;

(c) Substantial Completion, as defined in the WIFIA Loan Agreement, has been achieved and the Substantial Completion Date is [___]; and

(d) The total federal assistance provided to the Project, including the Maximum Principal Amount, does not exceed eighty percent (80%) of Total Project Costs.

**CITY OF SANDY,**
**CLACKAMAS COUNTY, OREGON,**
by its authorized representative

By: _____
Name:
Title:

## EXHIBIT H-1

## OPINIONS REQUIRED FROM GENERAL COUNSEL TO BORROWER

An opinion of the counsel of the Borrower, dated as of the Effective Date, to the effect that:

(a) the Borrower is duly formed, validly existing, and in good standing under the laws of the State of Oregon;

(b) the Borrower has all requisite power and authority to conduct its business and to execute and deliver, and to perform its obligations under the WIFIA Loan Documents to which it is a party;

(c) the Authorizing Ordinance was duly adopted at a meeting of the City Council of the Borrower on June 17, 2024, which was duly called and held pursuant to law and with all public notice required by law, if necessary, and at which a quorum was present and acting throughout, and the Authorizing Ordinance is in full force and effect and has not been modified, amended, rescinded or repealed;

(d) the Authorizing Resolution was duly adopted at a meeting of the City Council of the Borrower on [_____], 2024, which was duly called and held pursuant to law and with all public notice required by law, if necessary, and at which a quorum was present and acting throughout, and the Authorizing Resolution is in full force and effect and has not been modified, amended, rescinded or repealed;

(e) the execution and delivery by the Borrower of, and the performance of its respective obligations under, the WIFIA Loan Documents to which it is a party, have been duly authorized by all necessary organizational or regulatory action, and other than the Borrower's Organizational Documents and the WIFIA Loan Documents, no further instruments or documents are necessary for the Borrower to execute and deliver, and to perform its obligations under, the WIFIA Loan Documents to which it is a party and to consummate and implement the transactions contemplated by the WIFIA Loan Documents;

(f) the Borrower has duly executed and delivered each WIFIA Loan Document to which it is a party and each such WIFIA Loan Document constitutes the legal, valid and binding obligation of such party; enforceable against such party in accordance with their respective terms;

(g) no authorization, consent, or other approval of, or registration, declaration or other filing with any governmental authority of the United States of America or of the State is required on the part of the Borrower for the execution and delivery by such party of, and the performance of such party under, any WIFIA Loan Document to which it is a party other than authorizations, consents, approvals, registrations, declarations and filings that have already been timely obtained or made by the Borrower;

(h) the execution and delivery by the Borrower of, and compliance with the provisions of, the WIFIA Loan Documents to which it is a party in each case do not (i) violate the Organizational Documents of the Borrower, (ii) violate the law of the United States of America or of the State or (iii) conflict with or constitute a breach of or default under any material agreement or other instrument known to such counsel to which the Borrower is a party, or to the best of such

counsel's knowledge, after reasonable review, any court order, consent decree, statute, rule, regulation or any other law to which the Borrower is subject;

(i) the Borrower is not an investment company required to register under the Investment Company Act of 1940, as amended; and

(j) to the knowledge of such counsel after due inquiry, there are no actions, suits, proceedings or investigations against the Borrower by or before any court, arbitrator or any other Governmental Authority in connection with the Related Documents or the Wastewater System (including the Project) that are pending.

## EXHIBIT H-2

## OPINIONS REQUIRED FROM BOND COUNSEL TO BORROWER

An opinion of bond counsel, dated as of the Effective Date, to the effect that: [18]

(a) The Borrower has been duly created and validly exists as a municipal corporation of the State under and pursuant to the [Oregon Revised Statutes], with good right and power to issue the WIFIA Bond.

(b) The Borrower has the right and power under the laws of the State to enter into the WIFIA Loan Documents and the WIFIA Bond, and each has been duly authorized, executed and delivered by the Borrower, is in full force and effect, and constitutes a legal, valid and binding agreement of the Borrower enforceable against the Borrower in accordance with its respective terms and conditions.

(c) the WIFIA Bond (i) is secured by a valid lien on and security interest in the Pledged Collateral, (ii) is enforceable under the laws of the State without any further action by the Borrower or any other Person, and (iii) ranks *pari passu* in right of payment and right of security with all Parity Obligations and are senior in right of payment and right of security to all Subordinate Obligations;

(d) the Lien on the Net Revenues to secure the WIFIA Bond for the benefit of the WIFIA Lender is and shall be (i) on a parity in right of payment and right of security to the Lien on the Net Revenues in favor of all other Parity Obligations and (ii) senior in right of payment and right of security to the Lien on the Pledged Collateral in favor of any Subordinate Obligations;

(e) the WIFIA Loan Documents create the valid and binding assignment and pledge of the Pledged Collateral to secure the payment of the principal of, interest on, and other amounts payable in respect of, the WIFIA Bond, irrespective of whether any party has notice of the pledge and without the need for any physical delivery, recordation, filing or further act;

(f) all actions by the Borrower that are required for the application of Gross Revenues as required under the WIFIA Loan Agreement have been duly and lawfully made; and

(g) the Borrower has complied with the requirements of State law to lawfully pledge the Pledged Collateral and use the Gross Revenues as required by the terms of the WIFIA Loan Agreement.

[18] **Note to Borrower**: Comments received and under review, subject to review of draft opinion of General Counsel to the Borrower.

Beery Elsner & Hammond LLP
ATTORNEYS AT LAW

July [19], 2024

Jennifer Coker, P.E.
Public Works Director
Sandy City Hall
39250 Pioneer Blvd.
Sandy, OR 97055
JCoker@ci.sandy.or.us

United States Environmental Protection Agency
WJC-E 7334A
1200 Pennsylvania Avenue NW
Washington, DC 20460
Attn: WIFIA Director
Email: WIFIA_Portfolio@epa.gov

Re: WIFIA Loan Agreement for the Sandy Wastewater System Improvements Project
WIFIA ID ____

To Whom it May Concern:

As you know, this firm serves as the City Attorney for the City of Sandy, and we have acted as Borrower's Counsel in connection with the execution and delivery by the City of Sandy ("City" or "Borrower") of the above referenced WIFIA Loan Agreement dated [July 15, 2024], between Borrower and the United States Environmental Protection Agency, an agency of the United States of America, acting by and through the Administrator of the Environmental Protection Agency ("WIFIA Loan Agreement"). Capitalized terms used but not defined in this opinion have the respective meanings assigned to such terms in the WIFIA Loan Agreement.

I have examined the law and such proceedings and other documents as I deemed necessary to render this opinion. Based upon the foregoing, I am of the opinion that, as of the Effective Date of the WIFIA Loan Agreement, under existing Oregon law and applicable federal law:

(a) the Borrower is duly formed, validly existing, and in good standing under the laws of the State of Oregon;

(b) the Borrower has all requisite power and authority to conduct its business and to execute and deliver, and to perform its obligations under the WIFIA Loan Documents to which it is a party;

(c) the Authorizing Ordinance 2024-15 (the "Ordinance") was duly passed at a meeting of the City Council of the Borrower on June 17, 2024, which was duly called and held

pursuant to law and with all public notice required by law, and at which a quorum was present and acting throughout, and the Ordinance is in full force and effect and has not been modified, amended, rescinded or repealed;

(d) the Resolution was duly adopted at a meeting of the City Council of the Borrower on [August 5], 2024, which was duly called and held pursuant to law and with all public notice required by law, if necessary, and at which a quorum was present and acting throughout, and the Resolution is in full force and effect and has not been modified, amended, rescinded or repealed;

(d) the execution and delivery by the Borrower of, and the performance of its respective obligations under, the WIFIA Loan Documents to which it is a party, have been duly authorized by all necessary organizational or regulatory action, and other than the Borrower's Organizational Documents and the WIFIA Loan Documents, no further instruments or documents are necessary for the Borrower to execute and deliver, and to perform its obligations under, the WIFIA Loan Documents to which it is a party and to consummate and implement the transactions contemplated by the WIFIA Loan Documents;

(e) the Borrower has duly executed and delivered each WIFIA Loan Document to which it is a party and each such WIFIA Loan Document constitutes the legal, valid and binding obligation of such party; enforceable against such party in accordance with their respective terms;

(f) no authorization, consent, or other approval of, or registration, declaration or other filing with any governmental authority of the United States of America or of the State is required on the part of the Borrower for the execution and delivery by such party of, and the performance of such party under, any WIFIA Loan Document to which it is a party other than authorizations, consents, approvals, registrations, declarations and filings that have already been timely obtained or made by the Borrower;

(g) the execution and delivery by the Borrower of, and compliance with the provisions of, the WIFIA Loan Documents to which it is a party in each case do not (i) violate the Organizational Documents of the Borrower, (ii) violate the law of the United States of America or of the State or (iii) conflict with or constitute a breach of or default under any material agreement or other instrument known to such counsel to which the Borrower is a party, or to the best of my knowledge, after reasonable review, any court order, consent decree, statute, rule, regulation or any other law to which the Borrower is subject;

(h) the Borrower is not an investment company required to register under the Investment Company Act of 1940, as amended; and

(i) to my knowledge, after due inquiry, there are no actions, suits, proceedings or investigations by or before any court, arbitrator or other Governmental Authority pending or, to the knowledge of the Borrower, threatened against or affecting the Related Documents or the Wastewater System (including the Project), other than that certain Consent Decree dated

September 11, 2023, Case No. 23-cv-968, by and between the United States of America, State of Oregon by and through the Department of Environmental Quality, Plaintiffs, v. City of Sandy, Oregon, Defendant.

This opinion is provided to the City as a legal opinion only, and not as a guaranty or warranty of the matters discussed herein. No opinions may be inferred or implied beyond the matters expressly stated herein. No qualification, limitation or exception contained herein shall be construed in any way to limit the scope of the other qualifications, limitations and exceptions. For purpose of this opinion, the terms "law" and "laws" do not include unpublished judicial decisions, and we disclaim the effect of any such decision on this opinion.

This firm serves as the City Attorney for the City, and we do not represent any other party in connection with the WIFIA Loan. This opinion is given to the City, as required of the City, in connection with the WIFIA Loan Agreement and may not be relied upon by any person other than the City and any person or entity to whom we may send a formal reliance letter indicating that the recipient is entitled to rely on this opinion.

Sincerely,

Unsigned draft
Ashleigh K. Dougill

# STAFF REPORT

| | |
|---|---|
| **Meeting Type:** | City Council |
| **Meeting Date:** | August 5, 2024 |
| **From:** | Jennifer Coker, Public Works Director |
| **Subject:** | Purchase Authorization: Membrane Equipment for Alder Creek Water Treatment Plant Upgrades |

**DECISION TO BE MADE:**

Whether to authorize the City Manager to execute a procurement contract for the purchase of Membrane Equipment for the upgrade of the Alder Creek Water Treatment Plant.

**BACKGROUND / CONTEXT:**

Upgrades are required at the Alder Creek Water Treatment Plant (WTP) for the purpose of restoring a reliable water treatment system. It has been determined that the most cost-effective means to complete needed upgrades is to replace the existing aged, packaged filter systems with a new membrane filtration system.

A membrane filtration system is a package process unit that is designed, manufactured, assembled, and delivered to a project site, and the typical procurement to delivery duration is 15 to 18 months. Given the criticality of the Alder Creek water supply to Sandy residents, compounded by the pending work on the Bull Run supply system by the Portland Water Bureau and the unreliable nature of the existing Alder Creek filtration equipment, a decision was made in Q4 of 2023 to proceed with City procurement of the membrane filtration modular equipment to expedite schedule and minimize risk of service disruption.

City staff, the Veolia operations team, and the Stantec Program Management team also conducted site visits of prospective equipment existing installations in the fall of 2023 and conducted surveys with operators and owners, to fine-tune the specifications and requirements for the Equipment Package.

A Request for Proposals (RFP) was issued in February of 2024 with proposals requested in May. The RFP contained the minimum technical requirements of the proposed membrane filtration equipment, anticipated raw water quality, and required finished water quality requirements and a request for a commercial proposal to include capital cost as well as other life cycle estimates including: power demand, chemical demand, labor demand, replacement membrane pricing, and other variables for evaluation.

**KEY CONSIDERATIONS / ANALYSIS:**

Two firms responded to the request for technical and commercial proposals. The proposals were evaluated and ranked by City staff and by the Sandy Drinking Water Reinvestment Program (SDWRP) team. The scoring determined that H2O Innovation was the overall highest-ranked combination of technical and commercial proposals received.

The evaluation criteria included a combination of both technical and commercial criteria including initial capital costs, treatment efficacy, experience in Oregon, and operational costs (power, chemicals, and labor). The results of the evaluation were developed by the evaluation team as shown in Table 1 below:

**Table 1: Results of Proposal Scoring and Ranking**

| Vendor | Capital Cost | Technical Ranking [Envelope #1] | Price Ranking [Envelope #2] | Overall Proposal Ranking - Total |
|---|---|---|---|---|
| **H20 Innovation** | $2,802,888 | 59 | 30 | **89** |
| **Aria Filtra** | $5,810,000 | 62 | 20 | **82** |

Both proposers were similarly ranked in technical evaluation and were considered to be equal in terms of providing similar equipment for the City.

H20 Innovation's commercial proposal was more advantageous for the City, hence as a result the overall ranking resulted in an award to H20 Innovation as the best competitive proposal.

The H20 Innovation Contract price of $2,802,888 is a combination of the following bid items:

1) $75,000 for Piloting of proposed equipment;

2) $125,000 for Special Services (preparation of submittals and engineering from H2O Innovation); and

3) $2,602,888 for two 1.8 million gallon per day (MGD) membrane modular equipment packages

As requested by the request for proposals, H2O Innovation also included an optional additive price of $430,128 for additional membrane treatment capacity to achieve a total of 2.0 MGD for each module, and a monthly storage fee of $3,000 per month should it be necessary that upon completion of the module construction, the Alder Creek WTP construction progress is not sufficiently ready to receive the modules.

Given the competitive price, the SDWRP team recommends maximizing the installed capacity and production from Alder Creek to two units of 2.0 MGD each, and including the option of up to 6 months of storage as a risk management alternative to safeguard the membranes if there are schedule delays during construction of the balance of upgrades at the WTP.

The additive price is $430,128 for the additional capacity and $18,000 for up to six months of storage, bringing the total to $3,251,016.

A cost summary is provided in Table 2 below:

**Table 2: H2O Innovation Contract Summary**

| Item | Cost |
|---|---|
| Piloting | $75,000 |
| Special Services | $125,000 |
| Containerized Membrane Filtration system | $2,602,888 |
| **Subtotal** | **$2,802,888** |
| *Optional - Additional Membrane Capacity to 2.0 MGD per module* | *$430,128* |
| *Optional - 6 Months of Storage ($3,000/month for 6 months)* | *$18,000* |
| **Total** | **$3,251,016** |

The City's intent is to proceed with the design, construction and delivery of two 2.0 MGD membrane filtration modules.

Utilization of some or none of the storage will be determined by the SDWRP Team as delivery times are confirmed. Any unused portion of the Storage will be deducted from the Contract Price at completion.

Legal counsel for the City of Sandy as well as the State of Oregon Department of Environmental Quality Special Public Works Fund Loan program have reviewed and approved of the request for proposals prior to issuance, and the final procurement agreement.

The selected vendor, H20 Innovation has reviewed and approved the procurement contract and are currently finalizing signatures to the contract.

Council approval is sought to authorize the City Manager to execute a procurement contract for the purchase of Membrane Equipment for the upgrade of the Alder Creek Water Treatment Plant in the not-to-exceed amount of $3,251,016.

**BUDGET IMPACT:**

Funds for this membrane procurement are identified in the water capital appropriations for the BN 2023-25 budget and is financed from the Business Oregon Special Public Works Fund (SPWF) $9.5 Million B24004 loan. The purchase of the membranes and this loan are part of the $70 Million baseline budget for the Drinking Water Reinvestment Program (including Alder Creek upgrades and the Bull Run Pump Station and Conveyance System). Repayment will be made from water rate revenues and is included in the water rate model.

**RECOMMENDATION:**

Authorize the City Manager to execute contract with H2O Innovation for a not-to-exceed value of $3,251,016.

**SUGGESTED MOTION LANGUAGE:**

“I move to authorize the City Manager to execute the Membrane Equipment Procurement contract for Alder Creek Water Treatment Plant upgrades with H2O Innovation in an amount not to exceed $3,215,016.”

**LIST OF ATTACHMENTS / EXHIBITS:**

A) H2O Innovation Contract
B) RFP
C) H2O Innovation Power of Attorney

# SECTION 00 52 00 PROCUREMENT AGREEMENT

This agreement is between the City of Sandy ("Buyer") and
_____ ("Seller").

## ARTICLE 1 – RECITALS

1.01 The Project for which the Goods and Special Services are to be provided under the Contract Documents is generally described as follows: City of Sandy Alder Creek Water Treatment Plant Upgrade Project that will include an on-site proof of performance pilot test and furnishing a complete set of two (2) hollow fiber membrane containers each with a firm capacity of 2.0 mgd.

1.02 The Seller manufactures membrane filtration systems used in water treatment plants.

1.03 Seller shall furnish the Goods and Services as specified or indicated in the Contract Documents.

## ARTICLE 2 -- GOODS AND SPECIAL SERVICES

2.01 The Seller shall provide and operate a membrane filtration pilot system on the buyer's Alder Creek water treatment plant site to validate the Seller's membrane filtration media and system, design parameters, and operating guarantees. If the Buyer determines that the pilot test is successful, the Buyer will provide the Seller with written notice. The Buyer reserves the right to evaluate the Seller's performance during the pilot study and use that as a basis for evaluating successful completion.

2.02 The Buyer will execute the Agreement, subject to Seller's exceptions herein, and administer the Contract for Special Engineering Services associated with the preparation of Shop Drawings and other Submittals required for the project.

2.03 The Buyer is not obligated under this Agreement beyond Special Engineering Services and pilot testing until it issues a "Notice to Commence Fabrication" to the Seller. A Notice to Commence Fabrication may be issued at any time for a period of 365 days after the effective date of the Agreement.

2.04 Upon "Notice to Commence Fabrication" from the Buyer to the Seller, the Seller shall then:

A. Fabricate and deliver membrane filtration equipment and ancillary components (the "Goods") to the Facility,

B. Assist during installation and commission the Goods,

C. Deliver operational and maintenance manuals,

D. Provide operations assistance for one year after installation of the Goods, and

E. Warranty the membrane modules and system per the Contract Documents.

2.05 The Buyer retains the right to assign the remaining portion of the work, which includes the production, delivery and commissioning of the goods and all associated Special Services, to a Contractor.

2.06 The Seller shall deliver the required Bonds and insurance certificates in accordance with Article 4 of the General Conditions.

A. At the time of the effective date of the Agreement, a Performance Bond shall be provided for the Special Engineering Services for the full amount stated in Proposal.

B. Another Performance Bond and the Payment Bond shall be provided upon issuance of the "Notice to Commence Fabrication" in the full amount of the stated amount in Proposal.

2.07 The Buyer retains the right to terminate this Agreement after the pilot test and contract with another entity to provide membrane filtration equipment for the Facility.

## ARTICLE 3 – ENGINEER

3.01 The Contract Documents were prepared by Stantec Consulting Services Inc., 601 SW 2nd Ave, Suite 1400, Portland, OR 97204, Attn: Adam Odell, PE, Adam.Odell@stantec.com, 503.220.5409, hereinafter called "Engineer" and who is to assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents.

## ARTICLE 4 – POINT OF DESTINATION

4.01 The Goods shall be delivered to the point of destination: The Alder Creek Water Treatment Plant, which contains no known address, but is accessible from a private gravel road in between Whiskey Creek Rd. and E. Terra Fern Drive 7 miles east of Sandy, OR.

## ARTICLE 5 – CONTRACT TIMES

5.01 TIME IS OF THE ESSENCE

A. All time limits for Milestones for the delivery of Goods and the furnishing of services as stated in the Contract Documents are of the essence of the Contract.

5.02 DAYS TO ACHIEVE THE PROOF OF PERFORMANCE PILOT TEST

A. The dates for the pilot study are set forth in the following table:

| Item No. | Pilot Study Contract Time | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|---|
| | **Pilot Study** | | |
| A | Draft Work Plan | With Proposal | |
| B | Final Work Plan | Receipt of Engineer's Comments | 7 |
| C | Deliver pilot equipment | Effective Date of Agreement | 14 |
| D | Have Pilot Plant Operational at site | Effective Date of Agreement | 28 |
| D | Complete pilot study program | Effective Date of Agreement | 118 |
| E | Submit Draft Pilot Summary Report | Effective Date of Agreement | 118 |

| | | | |
|---|---|---|---|
| F | Submit Final Pilot Summary Report | Receipt of Engineer's Comments | 14 |

## 5.03 DAYS TO ACHIEVE SUBMITTAL OF SHOP DRAWINGS AND SAMPLES

A. All Shop Drawings and Samples required by the Contract Documents will be submitted to the Buyer for Engineer's review and approval in accordance with the following schedule.

**Special Engineering Services**

| Item | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. First Shop Drawing Submittal | Effective Date of Agreement | 45 |
| 2. First Shop Drawing Approval | Effective Date of Agreement | 90 |
| 3. Second Shop Drawing Submittal | Effective Date of Agreement | ~~75~~ 90 [Addendum #5] |
| 4. Second Shop Drawing Approval | Effective Date of Agreement | ~~120~~ 135 [Addendum #5] |

## 5.04 DAYS TO ACHIEVE DELIVERY OF GOODS

A. The Goods are to be complete and ready for the Buyer's receipt of delivery at the Facility in accordance with the following schedule:

**Goods**

| Item | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. Goods, excluding Computer Equipment, Membrane Modules, and Spare Parts | Notice to Commence Fabrication | 240 |
| 2. Computer Equipment | Notice of Completed Installation | 10 |
| 3. Membrane Modules | Notice of Completed Installation | 14 |
| 4. Spare Parts | Notice of Completed Installation | 30 |

1. The Seller shall not start to manufacture any Goods until the Shop Drawings have been approved and the Buyer has issued a "Notice to Commence Fabrication." The Goods, excluding the membrane modules, are to be fabricated and ready for delivery prior to 315 ~~240~~ 340 [Addendum #5] days after the "Notice to Commence Fabrication" is issued.

2. The Seller shall hold the spare parts, membrane modules and computer equipment and deliver to the Facility for installation during commissioning. The spare parts, computer equipment and membrane modules will be delivered in a timely manner as not to impede or delay the commissioning.

3. Long lead items may be purchased prior to "Notice to Commence Fabrication" if approval from Buyer is obtained. [Addendum #5].

## 5.05 PROJECT MILESTONES FOR SPECIAL SERVICES AND SELLER'S WARRANTEE AND GUARANTEE

A. The furnishing of Special Services to the Buyer will commence upon the execution of the Agreement between the Buyer and the Seller. The Seller shall deliver all Special Services required by the Contract Documents based upon the following milestones.

1. Special Engineering Services

   a. Upon execution of the Agreement, the Seller will begin to provide Special Engineering Services required for Shop Drawings and Samples.

2. Special Services

   a. Upon the issue of a Notice to Commence Fabrication, the following Contract Times will commence.

**Special Services**

| Contract Time | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. Installation Manuals | Notice to Commence Fabrication | 150 |
| 2. Commissioning | Notice of Completed Installation | 30 |
| 3. Operator Training | Notice of Completed Commissioning | 15 |
| 4. Preliminary O&M Manual | Notice of Completed Installation | 15 |
| 5. Acceptance Testing | Notice of Completed Operator Training | 45 |
| 6. Final O&M Manual | Notice of Substantial Completion | 45 |
| 7. Warranty Period | Notice of Substantial Completion | 365 |

   b. Operational and Maintenance Manuals shall be delivered at the times indicated in Section 01 73 00, Installation, Operations and Maintenance Manuals.

   c. In accordance with Section 01 62 00, Installation of Membrane Equipment, Special Services associated with the Installation of the Goods, shall commence with the delivery of the Goods and shall be completed when the “Notice of Completed Installation” is issued by the Engineer.

   d. In accordance with Section 01 66 00, Commissioning of Membrane Equipment, commissioning shall commence after the “Notice of Completed Installation” is issued and associated work has been completed. Upon completion of commissioning, a “Notice of Completed Commissioning” will be issued by the Engineer.

   e. In accordance with Section 01 73 10, Training of Operations and Maintenance Personnel, Operator Training shall commence after the “Notice of Completed Commissioning.” Upon completion of Operator Training, a “Notice of Training Completion” will be issued by the Engineer.

   f. In accordance with Section 01 67 00, Acceptance Testing of Membrane Equipment, acceptance testing shall not commence until after the prerequisite “Notice of Training Completion” is issued. Upon completion of Acceptance Testing, the “Notice of Substantial Completion” will be issued by the Engineer.

   g. In accordance with Section 01 68 00, Operations Assistance, operations assistance shall be provided in accordance with the requirements of that Section. The Correction Period shall commence on the date when the “Notice of Substantial Completion” is issued.

B. For the purposes of Seller’s warranty and guarantee, the following Project milestones are as follows:

   1. In accordance with Section 01 74 00, Membrane System and Module Warranty, the Membrane Module Warranty Period shall commence on the date when the Acceptance Testing first begins.

2. The Correction Period shall commence on the date the “Notice of Substantial Completion” is issued.

5.06 LIQUIDATED DAMAGES

A. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if the Special Engineering Services are not delivered to the Buyer within the times specified in Paragraph 5.02, above. They also recognize that the timely performance of services by other parties involved in the Buyer’s Project are materially dependent upon the Seller’s specific compliance with the requirements of Paragraph 5.02 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable submittals are not delivered on time. Accordingly, and instead of requiring proof of such losses or damages, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty), the Seller shall pay the Buyer $2,500.00 for each day that expires after the times or dates specified in Paragraph 5.02 for deliveries of acceptable submittals. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

B. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if 1) the Goods, associated with the Membrane Filtration System are not fabricated and ready for delivery to the Buyer within the time specified in Paragraph 5.03 above, or 2) if the membrane modules are not delivered in a timely manner as stated in Paragraph 5.03 above. They also recognize that the timely performance by other parties involved in the Buyer’s Project are materially dependent upon the Seller’s specific compliance with the requirements of Paragraph 5.03 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable Goods or membrane modules are not delivered on time. Accordingly, and instead of requiring proof of such losses or damages, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty) the Seller shall pay Buyer $2,500.00 for each day that expires after the times or dates specified in Paragraph 5.03 for delays involving delivery of the Goods. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

C. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if the Special Services are not delivered in a timely manner as stated in Paragraph 5.04, above. They also recognize that the timely performance by other parties involved in the Buyer's Project are materially dependent upon the Seller's specific compliance with the requirements of Paragraph 5.04 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable Goods, membrane modules or Special Services are not delivered on time. Accordingly, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty) the Seller shall pay Buyer $1,000.00 for each day that expires after the times or dates specified in Paragraph 5.04 for delays involving delivery of the Special Services. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

D. The Buyer may deduct the amount of liquidated damages from monies due the Seller under this Agreement. Liquidated damages shall not exceed five (5) percent of the contract price.

E. The liquidated damages provided in this Section shall be Buyer's sole and exclusive remedy for Seller's late delivery of Special Engineering Services, Goods, and Special Services.

F. If Seller is prevented from achieving the delivery times, milestone submittal dates or response times as defined in Articles 5.02A.5, 5.03D, and 5.03E, for any reason beyond Seller's reasonable control and not attributable to its actions or inactions, Seller shall not be assessed liquidated damages and shall be entitled to an adjustment of the Contract Times in an amount equal to the duration of the reason or event causing the delay in delivery.

G. Upon receipt of Buyer's Notice to Commence Fabrication of Equipment that satisfies Seller's requirements for meeting the delivery schedule, Seller shall commence fabrication of equipment. The place of delivery specified therein shall be firm and fixed, provided that Buyer may notify Seller no later than 45 days prior to the scheduled shipment date of the products of an alternate point of delivery (the "Alternate Delivery Site"). Provided the parties agree to a variation to take into account any additional cost [or delay] incurred by Seller in implementing this change, the Alternate Delivery Site shall become the agreed place of delivery for all purposes under this Agreement. In such event the following conditions shall apply: (i) title and risk of loss shall pass to the Buyer upon delivery of the products to the Alternate Delivery Site; (ii) any amounts payable to the Seller upon delivery or shipment shall become payable upon delivery of the products to the Alternate Delivery Site; (iii) any additional expenses incurred by the Seller in connection with such shipment to storage shall become payable by the Buyer upon submission of the Seller's invoice(s) (including but not limited to costs of any additional transportation, preparation for and placement into storage, handling, inspection, preservation, insurance, storage, removal charges and any applicable taxes); (iv) transportation of the products from the storage facility to their place of installation shall be the Buyer's responsibility; and, (v) if the Contract includes Services, subject to the terms and conditions in the Contract the Seller shall resume provision of Services to Buyer when instructed to do so by Buyer provided that all amounts due hereunder plus any cost incurred by Seller in delaying such Services have been paid.

5.07 LIQUIDATED DAMAGES FOR PILOT STUDY

A. During the Pilot Study, should the results indicate system performance capabilities that are less than those defined in Sections 11 30 00, Hollow Fiber Membrane Equipment, the Seller shall modify its equipment to meet the minimum defined system performance capabilities, repeat the entire duration of the Pilot Study, and pay for liquidated damages to account for the loss suffered by the Buyer due to schedule delay. Liquidated damages shall be assessed at $500 per day starting at the determination of Pilot Study initial attempt failure until the commencement of the Pilot Study second attempt up to a maximum amount of $5,000. Should the second attempt of Pilot Study yield system performance results that are less than those defined herein, the Seller will be deemed non-responsive and the Buyer may begin to negotiate with the next lowest responsive Proposer.

B. The liquidated damages provided in this Section shall be Buyer's sole and exclusive remedy for Seller's failure to meet the Pilot Study requirements of this Agreement.

C. Liquidated damages shall be assessed per day of delay and in the event that there are multiple items where the Contract Times has been exceeded Liquidated Damages shall not be combined.

**ARTICLE 6 – CONTRACT PRICE**

6.01 The Buyer shall pay Seller for furnishing the Goods and Special Services in accordance with the Contract Documents in current funds as follows:

A. The prices stated in Seller's Proposal, attached hereto as an exhibit.

B. Seller shall pay all applicable taxes and duties.

C. The Contract Price for membrane units and ancillary equipment shall remain valid for 180 days after the effective date of the agreement. If the "Notice to Commence Fabrication" is issued after 180 days from the effective date of the agreement (up to a maximum of 3 years), the Contract Price will be adjusted through Change Order. Contract Price adjustment will be the ratio of the Producers Price Index (PPI) of the PPI of month that the "Notice to Commence Fabrication" is issued, to the PPI of 180 days after the effective date of the agreement.

D. Membrane modules shall be made available for purchase by the Buyer at the pricing offered in the Proposal Pricing Form and that the pricing for future membrane modules, as part of a warranty claim or replacement purchase, shall be in accordance with the methods described in 01 74 00, Membrane System and Module Warranty. Membrane Module Pricing shall remain effective for a period of 20 years after the proposal date.

E. In the event that the City (or Contractor if the Contract is assigned) does not issue the "Notice of Completed Installation" within 500 days after the "Notice to Commence Fabrication", 40 percent of the Contract Price shall be adjusted through Change Order by the ratio of the PPI of the month the "Notice of Completed Installation" to the month of 500 days after the "Notice to Commence Fabrication".

1. This Change Order mechanism is provided in the event that there is an unforeseen delay during construction. The above provision is provided as the sole compensation to the Seller for the delay in the delivery of membrane modules and applicable Special Services described in Paragraph 5.03.A of the Agreement.

2. The applicable provisions of Paragraph 5.03.A remain contractual obligations of the Seller.

F. By issuance of a Change Order, all Alternate Proposal pricing in the Proposal Form shall remain open and subject to acceptance by the Buyer for a period of 2 years after the proposal date.

**ARTICLE 7 – PAYMENT PROCEDURES**

7.01 SUBMITTAL AND PROCESSING OF PAYMENTS

A. Seller shall submit Applications for Payment in accordance with Article 13 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

7.02 PROGRESS PAYMENTS

A. Buyer shall make progress payments on account of the Contract Price on the basis of Seller's Applications for Payment as follows:

1. Progress Payments for Special Engineering Services:

a. The Buyer shall pay Seventy-Five Thousand Dollars ($75,000.00) for Pilot Testing Services provided as part Paragraph 10.01.A.1.a.1 of the General Conditions, to the Seller upon the Buyer's approval of the first Application for Payment for Pilot Testing Services, submitted in accordance with Paragraph 10.01.A.1 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 10.2.A of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

b. The Buyer shall pay One Hundred and Twenty Five Thousand Dollars ($125,000.00) for Special Engineering Services provided as part, Paragraph 10.01.A.1.a.2 of the General Conditions to the Seller upon the Buyer's approval of the Application for Payment for Special Engineering Services, submitted in accordance with Paragraph 10.01.A.1 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 10.02.A of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

2. Progress Payments for Goods and Special Services.

a. The Buyer shall make progress payments on the Total Contract Price for Goods and Special Services in accordance with Article 10 of the General Conditions and based upon the following schedule:

**Payment Schedule**

| Payment | Contract Milestone(s) | Percentage of Total Contract Price |
|---|---|---|
| First Application | Notice to Commence Fabrication | 75 |
| Second Application | Delivery of Goods | 90 |
| Final Application | Notice of Substantial Completion | 100 |

b. The Buyer shall pay the above percentages of the Total Contract Price provided as part Paragraph 13.01 of the General Conditions to the Seller upon the Buyer's approval of the Application for Payment, submitted in accordance with Paragraph 13.01 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 13.02 of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 13.02 of the General Conditions.

c. The Total Contract Price is the Total Contract Price as indicated in the Proposal Pricing Form as adjusted through change order less liquidated damages assessed as part of the Contract.

7.03 FINAL PAYMENT

A. Upon the Buyer's approval of the final Application for Payment, accompanied by the Engineer's recommendation for payment in accordance with Article 13 of the General Conditions, the Buyer shall make the final payment to bring the total payment to 100 percent of the Contract Price as adjusted for changes to the Contract Price or less any prior payments to the Seller. This payment, at the Engineer's recommendation, may be less such amounts, as Engineer shall determine in accordance with the Agreement or any applicable provisions of the General Conditions.

B. The Final Payment shall be accompanied by a "Notice of Contract Completion" executed by both parties.

**ARTICLE 8 -- INTEREST**

8.01 Subject to the provisions of Article 13 of the General Conditions, all monies not paid within 60 days after the receipt of the Seller's Application for payment shall accrue interest at the rate of the 6 percent per annum.

**ARTICLE 9 - SELLER'S REPRESENTATIONS**

9.01 In order to induce Buyer to enter into this Agreement, Seller makes the following representations:

A. Seller has examined and carefully studied the Contract Documents and the other related data identified in the Proposal Documents.

B. If specified or if, in Seller's judgment, any local condition may affect cost, progress or the furnishing of the Goods and Special Services, Seller has visited the Facility location and become familiar with and is satisfied as to the local conditions that may affect cost, progress or the furnishing of the Goods and Special Services.

C. Seller is familiar with and is satisfied as to all local federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of the Goods and Special Services.

D. Seller has carefully studied and correlated the information known to Seller, and information and observations obtained from Seller's visits, if any, to the Point of Destination, with the Contract Documents.

E. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Seller.

F. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Special Services.

G. The Seller has provided test data from either full-scale operation(s) or pilot test data from facilities of similar water quality to the Project as information and design concepts for its proprietary membrane system. In providing the information and design concepts for this Project, the Seller has considered and incorporated the concept of "linear scalability" into its design. Linear scalability means that: 1) the Seller has considered and evaluated the design and operational requirements and results of pilot or demonstration testing, and 2) that the equipment provided by the Seller is warranted to produce water in proportion to the design and operational parameters established and demonstrated during pilot testing.

H. The concept of linear scalability relates to the surface area of the membrane and to its corresponding ability to produce water as a dependent variable on an incremental and proportional basis. Dependent variables are the parameters of specific or instantaneous design (e.g., membrane flux, process flows, temperatures, times, maximum pressures, and chemical dosages or consumption) requirements for filtration, backwashing, cleaning, and integrity testing processes that are established on a module basis during piloting and/or incorporated into the unit and system design provided by the Seller to meet the design capacity requirements established in the Contract Documents.

I. The concept of linear scalability excludes the independent variables that involve membrane removal performance and overall system performance established in the Contract Documents. Such independent variables include the water quality removal requirements, removal efficiency, and the minimum design requirements for Maintenance/Recovery Clean interval when the membrane system is operated within its intended process design range.

J. Seller's relationship to the Buyer in performance of this Agreement is that of an Independent Contractor. The personnel performing services under this Agreement shall at all times be under the Seller's exclusive direction and control and not employees of the Buyer. Seller shall pay all wages, salaries and other amounts due to its employees in connection with this agreement and shall be responsible for all applicable state, federal, and local reports and obligations respecting them such as labor wages, social security, income tax withholding, unemployment compensation and similar matters.

## ARTICLE 10 – CONTRACT DOCUMENTS

10.01 CONTENTS

A. The Contract Documents consist of the following:

1. Standard General Conditions for Procurement Contracts [Addendum #3]
2. Procurement Agreement
3. Exhibits to this Agreement (enumerated as follows):
    a. Exhibit A-1 to Agreement between Buyer and Seller dated _____, Assignment of Contract; Consent to Assignment; and Acceptance of Assignment.
    b. Exhibit A-2 to Agreement between Buyer and Seller dated _____ Agreement to Assignment by Seller's Surety.
    c. Seller's completed Proposal Form and Proposal Pricing Form.
    d. Documentation submitted by Seller prior to Notice of Award
    E. Exhibit B to Agreement between Buyer and Seller, Public Contracting Terms and Conditions
4. Performance Bond
5. Payment Bond
6. Section 00 80 50 Supplementary Conditions to EJCD Procurement General Conditions, P-200 (2000 Edition)
7. Conceptual Design Report – Alder Creek Water Treatment Plant Upgrade Project
8. Addenda (Numbers _____to _____, inclusive)
9. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
    a. Notice to Commence Fabrication
    b. Notice of Completed Installation
    c. Notice of Completed Commissioning
    d. Notice of Training Completion
    e. Notice of Substantial Completion
    f. Final Acceptance
    g. Written Amendment(s)
    h. Change Order(s)
    i. Field Order(s)

j. Engineer's Written Interpretation(s).

B. The documents listed in Paragraph 10.01 A. are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 10.

D. The Contract Documents may only be amended or supplemented as provided in Paragraph 3.04 of the General Conditions.

E. In resolving inconsistencies or ambiguities between two or more components of the Contract Documents, the highest precedence shall be given to the Agreement and the order of precedence shall decrease in the following manner:

1. Procurement Agreement

2. Owners comments on the Seller's Proposal Documents (U5588 City of Sandy OR - Envelope 1 - H2OI's Proposal dated April 11, 2024 and U5588 City of Sandy OR - Envelope 2 - H2OI's Proposal dated April 11, 2024)

3. Seller's Proposal (U5588 City of Sandy OR - Envelope 1 - H2OI's Proposal dated April 11, 2024 and U5588 City of Sandy OR - Envelope 2 - H2OI's Proposal dated April 11, 2024)

4. Section 00 80 50 Supplementary Conditions to EJCD Procurement General Conditions, P-200 (2000 Edition)

5. Standard General Conditions for Procurement Contracts [Addendum #3]

6. Addenda

7. Specification Section 01 74 00, Membrane System and Module Warranty

8. Exhibits to the Agreement

9. Performance Bond

10. Payment Bond.

11. Certificates of Insurance

12. Final Acceptance(s)

13. Change Order(s)

14. Engineer's Written Interpretation(s)

15. Field Order(s)

16. Notice(s) of Substantial Completion

17. Notice(s) of Training Completion

18. Notice(s) of Completed Commissioning

19. Notice(s) of Completed Installation

20. Notice(s) to Commence Fabrication

21. Project Specifications shall be used to govern the quality of the Goods.

22. Submittals provided by the Seller in fulfillment of the Contract.

F. In the event of a conflict between a schedule or a schedule update and a specific requirement of these Contract Documents, the Contract Documents shall, at all times, have precedence. Submittal or acceptance of a schedule or schedule update shall not supersede the requirements of the Contract Documents.

**ARTICLE 11 – MISCELLANEOUS**

11.01 DEFINED TERMS

A. Terms used in this Agreement will have the meanings indicated in the General Conditions and the Supplementary Conditions.

11.02 ASSIGNMENT

A. Buyer has the right to assign the Contract for furnishing Goods and Special Services hereunder and Seller shall accept such assignment. Forms documenting the assignment of the Contract, and consent of Seller's surety to the assignment are attached as exhibits to this Agreement.

1. The Contract will be executed in the name of Buyer initially and may be assigned to a Construction Contractor designated by Buyer. The assignment will occur on the effective date of the agreement between Buyer and the Construction Contractor. As of the date of acceptance of assignment by the Construction Contractor, all references in the Contract Documents to Buyer shall mean the designated Construction Contractor whose responsibilities will include the installation and erection of the Goods.

2. The assignment of the Contract shall relieve Buyer from all further obligations and liabilities under the Contract. After assignment, Seller shall become a subcontractor or Seller to the assignee and, except as noted herein, all rights, duties, and obligations of Buyer under the Contract shall become the rights, duties and obligations of the assignee.

3. After assignment:

a. All performance warranties and guarantees required by the Contract Documents will continue to run for the benefit of Buyer and, in addition, for the benefit of the assignee.

1) Seller shall submit Applications for Payment to the Contractor who shall forward the Application for Payment to the Engineer.

2) Buyer will provide payment directly to the Seller.

b. Except as provided in this Paragraph 11.02.A.3.b., all rights, duties and obligations of Engineer to assignee and Seller under this Contract will cease.

1) Engineer will review Seller's Applications for Payment and make recommendations to assignee for payments as provided in Paragraphs 10.02 and 10.06 of the General Conditions.

2) Upon the written request of either the assignee or Seller, Engineer will issue with reasonable promptness such clarifications or interpretations of the Contract Documents, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications and interpretations will be final and binding on assignee and Seller unless:

a) an appeal from Engineer's clarification or interpretation is made within the time limits and in accordance with the dispute resolution procedures set forth in Article 13 of the General Conditions; or

b) if no such dispute resolution procedures have been set forth, a written notice of intention to appeal is delivered by assignee or Seller to the other within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision (unless otherwise agreed to in writing by assignee and Seller), to exercise such rights or remedies as the appealing party may have with respect to such clarification or interpretation in accordance with applicable Laws and Regulations.

3) When rendering a clarification or interpretation under Paragraph 11.02.A.3.b.2), Engineer will not show partiality to assignee or Seller and will not be liable in connection with any clarification or interpretation rendered in good faith.

c. Upon assignment, Seller shall provide Construction Contractor with revised insurance certificates listing both Construction Contractor and Buyer as additional insureds.

B. No other assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound. Specifically, but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law). Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

11.03 SUCCESSORS AND ASSIGNS

A. Buyer and Seller each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

11.04 CHOICE OF LAW AND VENUE

A. The laws of the State of Oregon shall govern the formation, interpretation, and performance of this Agreement. Venue for mediation and/or actions arising out of this Agreement shall be in Clackamas County, Oregon.

11.05 ENTIRE AGREEMENT

A. This Agreement that includes the Contract Documents contains the entire agreement, between the parties and supersedes all prior negotiations, discussions, obligations, and rights of the parties regarding the subject matter of this Agreement. There is no other written or oral understanding between the parties. No modification, amendment or alteration of this Agreement shall be valid unless it is in writing and signed by the parties hereto.

11.06 COUNTERPARTS

A. This Agreement may be executed in counterparts, which when taken together shall constitute a single signed original as though all parties had executed the same page.

11.07 AUTHORITY TO EXECUTE AGREEMENT

A. Each person signing on behalf of a corporation, partnership, joint venture or governmental entity hereby declares that he or she, or it has the authority to sign on behalf of his or her or its respective corporation, partnership, joint venture, entity and agrees to hold the other party or parties hereto harmless if he or she or it does not have such authority.

11.08 SELLERS TOTAL LIMITATION OF LIABILITY

A. Notwithstanding any other provisions of the Contract Documents, the Seller's total liability for direct damages arising at any time under any of the Contract Documents or otherwise in connection with completing the Contract (whether arising under breach of contract, tort, strict liability, or any other theory of law) shall not exceed the amount of the Contract Price. In no event shall either party be liable for any indirect, penalty, incidental, special, or consequential damages. Seller's aggregate liability under the Contract (whether arising under breach of contract, tort, strict liability, or any other theory of law) shall not exceed the amount of the Contract Price.

11.09

Seller shall substantially comply with all public contracting terms and conditions that are applicable to this Contract, including, but not limited to, those set forth in Exhibit B

BUYER: City of Sandy, Oregon

By: _____

Title _____

Executed on _____/_____, 20____ (month/day/year)

Attest By:

_____

Title _____

Approved As to Form:

_____

_____

SELLER: H2O Innovation USA, Inc.

By: _____

Denis Guibert - VP & Managing Director

[Corporate Seal]

Attest: _____

Address for giving notice:

8900, 109th Ave North, Suite 1000
Champlin, MN 55316

Agent for service of process:

_____

_____

_____

(If Seller is a corporation or a partnership, attach evidence of authority to sign.)

**EXHIBIT A-1** to Agreement Between BUYER and SELLER Dated:
_____

ASSIGNMENT OF CONTRACT; CONSENT TO ASSIGNMENT; AND ACCEPTANCE OF ASSIGNMENT

This assignment will be effective on the Effective Date of the Agreement between the Buyer and the construction contractor "Contractor". The Contract between the City of Sandy, Oregon ("Buyer") and _____
("Seller" as "MSS") for furnishing Goods and Special Services under the Contract Documents entitled **Membrane Equipment Procurement – Alder Creek Water Treatment Plant Upgrade Project** is hereby assigned, transferred, and set over to _____, ("Contractor"). Contractor shall be totally responsible for the performance of Seller and for the duties, rights, and obligations of Buyer, not otherwise retained by Buyer, under the terms of the Contract between Buyer and Seller. Upon assignment of this Procurement Agreement, Seller agrees to perform its obligations and duties to Buyer under the supervision and control of and as a subcontractor or Seller to the Contractor.

ASSIGNMENT DIRECTED BY:

City of Sandy, Oregon

_____
(Buyer)

(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement.)

By: _____

Title: _____

Executed on _____/_____ /_____

ASSIGNMENT ACKNOWLEDGED AND ACCEPTED BY:

_____
Seller

(If Seller is a corporation, attach evidence of authority to sign.)

By: _____
(Signature)

_____
(Title)

ASSIGNMENT ACCEPTED BY:

_____
Contractor

(If Construction Contractor is a corporation attach evidence of authority to sign.)

By: _____

**EXHIBIT A-2** to Agreement Between Buyer and Seller
Dated: _____

AGREEMENT TO ASSIGNMENT BY SELLER'S SURETY

Surety hereby acknowledges and agrees that the Contract for furnishing Goods and Special Services under the Contract Documents entitled **Membrane Equipment Procurement – Alder Creek Water Treatment Plant Upgrade Project** by and between the City of Sandy, Oregon ("Buyer") and _____ _____ ("Seller as MSS") may be assigned, transferred, and set over to _____ _____ ("Contractor"), in accordance with Paragraph 11.02 of Agreement between Buyer and Seller.

Surety further agrees that, upon assignment of the Contract, the Contractor shall have all the rights of the Buyer under the Performance Bond.

Surety Company _____

(Corporate Seal)

By: _____

Signature and Title
(Attach Power of Attorney)

END OF SECTION

# Exhibit B

## Public Contracting Terms

**Seller shall abide by all of the following terms and conditions throughout the term of the Agreement:**

**1. Records.**

A. Seller shall retain all books, documents, papers, and records that are directly pertinent to this Agreement for at least three (3) years after Buyer makes final payment on this Agreement and all other pending matters are closed.
B. Seller shall allow Buyer (or any of its authorized representatives) to audit, examine, copy, take excerpts from or transcribe any books, documents, papers, or records that are subject to the foregoing retention requirement.

**2. Overtime**.

Any person employed on work under this Agreement, other than a person subject to being excluded from the payment of overtime pursuant to either ORS 653.010 to 653.261 or 29 USC §201 to 209, shall be paid at least time and a half for all overtime worked in excess of 40 hours in any one week, and otherwise in accordance with in accordance with ORS 653.010 to ORS 653.261 and the Fair labor standards Act of 1938.

**3. Payment for Labor or Material.**

Seller shall make payment promptly, as due, to all persons supplying to Seller labor or materials for the prosecution of the work provided for in this Agreement. (ORS 279B.220)

**4. Contributions to the Industrial Accident Fund.**

Seller shall pay all contributions or amounts due the Industrial Accident Fund from Seller incurred in the performance of this Agreement, and shall ensure that all subcontractors pay those amounts due from the subcontractors. (ORS 279B.220)

**5. Income Tax Withholding.**

Seller shall pay to the Oregon Department of Revenue all sums withheld from employees pursuant to ORS 316.167. (ORS279B.220)

**6. No Liens or Claims.**

Seller shall not permit any lien or claim to be filed or prosecuted against the State or Oregon or a county, school district, municipality, municipal corporation or subdivision thereof, on account of any labor or material furnished. (ORS 279B.220)

**7. Payment of Claims by the Buyer.**

If Seller fails, neglects, or refuses to make prompt payment of any claim for labor or services furnished to Seller or a subcontractor by any person in connection with this Agreement as the claim becomes due, the Buyer may pay the claim to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due to Seller pursuant to this Agreement. The Buyer's payment of a claim under this Paragraph shall not relieve Seller or Seller's surety, if any, from responsibility for those claims.

**8. Workers' Compensation.**

Seller is a subject employer that will comply with ORS 656.017. Seller warrants that all persons engaged in contract work and subject to the Oregon Workers' Compensation law are covered by a workers' compensation plan or insurance policy that fully complies with Oregon law. Seller shall indemnify Buyer for any liability incurred by Buyer as a result of Seller's breach of the warranty under this Paragraph. (ORS 279B.230)

**9. Medical Care for Employees.**

Seller shall make payment of all sums to any person, co-partnership, association or corporation, furnishing medical, surgical and/or hospital care incident to the sickness or injury of Seller's employee(s), all sums which Seller agrees to pay for such services and all monies and sums which Seller collected or deducted from the wages of employees pursuant to any law, contract or contract for the purpose of providing or paying for such service. (ORS 279B.230)

**10. Non-discrimination.**

Seller agrees to comply with all applicable requirements of federal and state civil rights and rehabilitation statues, rules, and regulations. Seller also shall comply with the Americans with Disabilities Act of 1990, ORS 659A.142, and all regulations and administrative rules established pursuant to those laws

**11. Lawn or Landscaping.**

If the services or project under this Agreement contemplate lawn or landscape maintenance, Seller shall salvage, recycle, compost or mulch yard waste material at an approved site, if feasible and cost-effective. (ORS 278B.225)

**12. Federal Environmental Laws.**

Seller shall comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15).

**13. Tax Law Compliance.**

Seller (to the best of Seller's knowledge, after due inquiry), for a period of no fewer than six calendar years (or since the firm's inception if less than that) preceding the effective date of this Agreement, faithfully has complied with:

A. All tax laws of this state, including but not limited to ORS 305.620 and ORS chapters 316, 317, and 318;

B. Any tax provisions imposed by a political subdivision of this state that applied to Seller, to Seller's property, operations, receipts, or income, or to Seller's performance of or compensation for any work performed by Seller;

C. Any tax provisions imposed by a political subdivision of this state that applied to Seller, or to goods, services, or property, whether tangible or intangible, provided by Seller; and

D. Any rules, regulations, charter provisions, or ordinances that implemented or enforced any of the foregoing tax laws or provisions.

**14. Foreign Contractor.**

If Seller is not domiciled in or registered to do business in the state of Oregon, Seller shall promptly provide to the Oregon Department of Revenue and the Secretary of State Corporation Division all information required by those agencies relative to this Agreement. Seller shall demonstrate its legal capacity to perform these services in the state of Oregon prior to entering into this Agreement.

**CITY OF SANDY**

**SPECIFICATIONS FOR**

**ALDER CREEK WATER TREATMENT PLANT UPGRADE**

**PROFESSIONAL OF RECORD CERTIFICATION(s):**

| | |
|---|---|
| Adam Odell | I declare the Technical Specification(s) listed in the Specification TOC are applicable to the design for the subject project for the City of Sandy were prepared by me or under my supervision.<br>  |

# Table of Contents
## City of Sandy
## Alder Creek Water Treatment Plant Upgrade

## SECTION 00 10 00

## REQUEST FOR PROPOSALS

1. The City of Sandy requests Proposals for membrane equipment for its upgraded water treatment plant. Sealed Proposals, following a "two-envelope" approach outlined in Section 00 40 00, will be accepted until **2:00 PM Pacific Time on March 14th, 2024 "Proposal Closing Time." Proposals received after the deadline will not be accepted.** Further detail is found in Section 00 20 00, Instructions to Proposers, which is a part of this Request for Proposals. The anticipated schedule may be changed as needed.

| Activity | Date(s) |
|---|---|
| **Advertisement of RFP** | 02/14/24 |
| **Respondents to submit Proposals** | 03/14/24 |
| **City to review qualifications** | 03/27/24 |
| **City to issue Notice of Intent to Award (NOI)** | 04/04/24 |
| **Contract Negotiations Completed** | 05/02/24 |
| **Anticipated Council Approval of Agreement** | 05/20/24 |
| **Notice to Proceed** | 05/27/24 |

2. One PDF copy of the Proposal Documents will be provided to pre-qualified PROPOSERS. The BUYER will not be responsible for full or partial sets of Proposal Documents, including any addenda, obtained from other sources.

3. A Pre-Proposal Conference will not be held. All questions regarding the Proposal Documents shall be submitted in writing to the BUYER at least 10 days prior to the deadline for submitting proposals. Oral statements may not be relied upon and will not be binding or legally effective.

4. A Proposal Bond or certified bank check in the amount of 5 percent of the Base Proposal shall be included with each Proposal.

5. Contract Times for commencement and completion shall be in accordance with Article 5 of the Procurement Agreement.

6. The acceptance of any Proposal shall be subject to funds approved for such purposes.

7. Proposals shall be mailed, or hand delivered to Jenny Coker, P.E., Public Works Director, City of Sandy, 39250 Pioneer Boulevard, Sandy, OR 97055. Additional information may be obtained from Ms. Coker, (503) 668-6927, Jcoker@ci.sandy.or.us, or from Stantec, 601 SW 2nd Avenue, Suite 1400, Portland, OR 97204, Attn: Adam Odell, P.E., (503) 220-5409, Adam.Odell@Stantec.com. The outside of the envelope or box should be marked: "MEMBRANE PROPOSAL ENCLOSED."

8. This Request for Proposals may be cancelled or bids may be rejected for not complying with all prescribed procedures and requirements or when it is in the best interest of the City, as determined in its sole discretion. City is not liable to any bidder for any loss or expense caused by or resulting from the cancellation or rejection of a solicitation, bid, proposal or award.

9. This project was funded in part with a financial award from the Special Public Works Fund, funded by the Oregon State Lottery and administered by the Oregon Infrastructure Finance Authority

10. Any and all bids may be rejected for good cause on a finding that it is in the public interest to do so.

Dated: February 14th, 2024

**City of Sandy, OR**
c/o Jenny Coker, PE
39250 Pioneer Blvd.
Sandy, OR 97055
(503) 668-6927
Jcoker@ci.sandy.or.us

Engineer:

**Stantec Consulting Services Inc.**
Attn: Adam Odell, P.E.
601 SW 2nd Avenue, Suite 1400
Portland, OR 97204
(503) 220-5409
Adam.Odell@Stantec.com

**END OF SECTION**

## RESPONSIBILITY INQUIRY

The City will determine responsibility of a firm prior to award and execution of a contract. In addition to this form, the City may obtain any information the City deems necessary to make the determination. The City will notify the firm of any other documentation required, which may include, but is not limited to, Oregon Department of Revenue Letter of Debt Compliance, recent profit-and-loss history; current balance statements and cash flow information; assets-to-liabilities ratio, including number and amount of secured versus unsecured creditor claims; availability of short and long-term financing; bonding capacity; insurability, credit information; material; equipment; facility and personnel information; record of performance under previous contracts; etc. The City may postpone the award of the Contract in order to complete its investigation and evaluation. Failure to promptly provide requested information and clearly demonstrate Responsibility may result in offer rejection and ineligibility of contract award.

**1.** Does your firm have available the appropriate financial, material, equipment, facility and personnel resources and expertise, or ability to obtain the resources and expertise, necessary to demonstrate the capability of the firm to meet all contractual responsibilities? YES ☐ / NO ☐.

**2.** Number of years in business providing the services/goods/equipment required under the prospective contract:

**3.** **a)** Is your firm experiencing financial distress or having difficulty securing financing? YES ☐ / NO ☐. **b)** Does your firm have sufficient cash flow to fund day-to-day operations throughout the proposed contract period? YES ☐ / NO ☐ If "YES" on question 3.a or "NO" on question 3.b, please provide additional details.

Response:

**4.** Within the last 3-year period, has your firm had one or more contracts terminated for contractor default by any federal, state or local government agency, or any lawsuits filed against it by creditors or involving contract disputes? YES ☐ / NO ☐**.** If "YES," please explain. (With regard to judgments, include jurisdiction and date of final judgment or dismissal.)

Response:

**5.** Is your firm, a major partner or major shareholder (defined as a partner or shareholder owning 10% or more of your firm), a major subcontractor (defined as receiving 10% or more of the total Contract amount), or any principal officer of your firm, major partner, major shareholder, or major subcontractor presently, or within the last 3 years has been convicted of, indicted for, or otherwise criminally or civilly charged by a governmental entity with the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of federal or state antitrust statutes relating to the submission of bids or Proposals; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property? YES ☐ / NO ☐. If "YES," indicate the jurisdiction, date of indictment, charge or judgment and names and summary of charges.

Response:

**6.** Within the last 3-year period, has your firm filed a bankruptcy action, filed for reorganization, made a general assignment of assets for the benefit of creditors, or had an action for insolvency instituted against it? YES ☐ / NO ☐. If "YES," indicate the filing dates, jurisdictions, type of action, ultimate resolution, and dates of judgment or dismissal, if applicable.

Response:

**7.** **a)** Within the last 3-year period, has your firm been notified of any delinquent Federal or State taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. YES ☐ /NO ☐. **b)** Does your firm have any liquidated and delinquent debt owed to the State or any department or agency of the State? If "YES" on 7.a or 7.b or both, please explain. YES ☐ /NO ☐

Response:

**8.** Does your firm have all required licenses, insurance and/or registrations, if any, and is the firm legally authorized to do business in the State of Oregon. YES ☐ /NO ☐. If "NO," please explain.
Response:

**9.** Within the last 3-year period, has your firm completed previous contracts of a similar nature with a satisfactory record of performance? [For purposes of this question, a satisfactory record of performance means that to the extent that the costs associated with and time available to perform a previous contract remained within your firm's control, your firm stayed within the time and budget allotted for the procurement and otherwise performed the contract in a satisfactory manner.]
YES ☐ /NO ☐. If "NO," please explain.
Response:

**AUTHORIZED SIGNATURE**
By signature below, the undersigned Authorized Representative on behalf of Bidder/Proposer certifies that the responses provided on this form are complete, accurate, and not misleading.

| Name of Firm: | RFP # (if applicable):<br>Project Name: |
|---|---|

_____
Authorized Signature Date

_____
Print Name Title

# SECTION 00 20 00 INSTRUCTIONS TO PROPOSERS

## ARTICLE 1 -- DEFINED TERMS

1.01 Terms used in these Instructions to Proposers have the meanings indicated in the General Conditions. Additional terms used in these Instructions to Proposers have the meanings indicated below which are applicable to both the singular and plural thereof:

A. Any reference or use of the word “Bid” or “Bidder” contained in the Contract Documents shall be interpreted as “Proposal” or “Proposer.”

B. The City of Sandy shall act in the role of “Buyer”, “Owner”, or “City”.

C. The Membrane System Supplier (MSS) shall act in the role of “Seller” or “Supplier.”

D. The membrane element manufacturer (MEM) shall supply membrane modules to the MSS.

## ARTICLE 2 -- COPIES OF PROPOSAL DOCUMENTS

2.01 Complete sets of the Proposal Documents shall be used in preparing Proposals including Volumes 1, 2, and 3; neither the Buyer nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

2.02 Buyer and Engineer in making copies of Proposal Documents available on the above terms do so only for the purpose of obtaining Proposals for furnishing Goods and Special Services and do not confer a license or grant for any other use.

2.03 Reproduction and/or distribution of the Proposal Documents to another party that is not directly associated with the project is strictly prohibited.

## ARTICLE 3 -- QUALIFICATIONS OF PROPOSERS

3.01 This request for Proposals is open only to pre-qualified Proposers. A Proposal may be rejected if the Proposer cannot meet the deadlines established in the Contract Documents.

A. Based on the Buyer’s review, the following MSS’s are acceptable

1. PALL Water

2. H2O Innovation

B. Based on the Buyer’s review, the following MEMs and modules are acceptable:

1. PALL (ASAHI) UNA-620A Microfiltration Membrane Module

2. Toray HGUF2020AN Ultrafiltration Membrane Module

3. No request for approved equals will be accepted for other MEMs

3.02 By issuing a Bid pursuant to this RFP, the Seller represents and warrants that it shall provide the goods and services requested in the RFP in accordance with the highest standards prevalent in the industry or business most closely involved in providing such goods and services.

3.03 If the Seller has multiple options, such as different equipment arrangements, the Seller may provide the Buyer with two Proposals. Instructions are provided in Article 11.

**ARTICLE 4 -- EXAMINATION OF PROPOSAL DOCUMENTS AND POINT OF DESTINATION**

4.01 Upon request, the Buyer will provide Proposer reasonable access to the facility location to conduct investigations, examinations, tests, and studies that Proposer deems necessary for submission of a Proposal.

4.02 Before submitting a Proposal, Proposers shall:

A. Examine and carefully study the Proposal Documents, including any Addenda and the related data identified in the Proposal Documents;

B. Become familiar with all federal, state, and local laws and regulations that may affect cost, progress, or the furnishing of Goods and Special Services;

C. Carefully study and correlate the information known to Proposer, and information and observations obtained from Proposers visits, if any, to the facility location, with the Proposal Documents;

D. Promptly give Engineer written notice of all conflicts, errors, omissions, ambiguities, or discrepancies that Proposer discovers in the Proposal Documents and obtain written confirmation from the Engineer of the resolution of the issues; and

E. Determine that the Proposal Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Special Services.

**ARTICLE 5 -- PRE-PROPOSAL CONFERENCE**

5.01 A Pre-Proposal Conference will not be held. All questions regarding the Proposal Documents shall be submitted in writing to the Buyer no later than the date indicated in Article 6 of the Instructions to Proposers. Oral statements by the Buyer or Engineer may not be relied upon and will not be binding or legally effective.

## ARTICLE 6 -- INTERPRETATIONS AND ADDENDA

6.01 All questions about the meaning or intent of the Proposal Documents are to be submitted to the Buyer in writing. Interpretations or clarifications considered necessary by the Buyer in response to such questions will be issued by addenda mailed or delivered to all parties having received the Proposal Documents. Questions received less than ten days prior to the Proposal Closing Time will not be answered. Only answers in the Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

6.02 Addenda may be issued to clarify, correct, or change the Proposal Documents.

6.03 Right to Protest: A Proposer may protest specifications or Contract terms and conditions. Protests must be in writing and delivered to the Buyer not less than 10 days prior to the Proposal closing time.

## ARTICLE 7 -- PROPOSAL SECURITY

7.01 A Proposal must be accompanied by Proposal security made payable to the Buyer, in an amount of 5 percent of the base Proposal Pricing and in the form of a certified bank check, irrevocable letter of credit issued by an insured institution acceptable to the State of Oregon, or a Proposal Bond, on the form attached, issued by a surety meeting the requirements of Paragraph 4.1.B of the General Conditions.

7.02 The Proposal security for all Proposers shall be retained until the Buyer completes the Procurement Proposal evaluation in accordance with Section 00 31 00, Proposal Evaluation. The Proposal security of the apparent successful Proposer will be retained until such Proposer has executed the agreement, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Proposal security will be returned. If the apparent successful Proposer fails to execute and deliver the agreement and furnish the required Contract security within 15 days after the Notice of Award, the Buyer may annul the Notice of Award and the Proposal security of that Proposer will be forfeited. The Proposal security of other Proposers whom the Buyer believes to have a reasonable chance of receiving the award may be retained by the Buyer until the earlier of seven days after the Procurement Proposal evaluation or 60 days after the Proposal Opening Time, whereupon the Proposal security furnished by such Proposers will be returned.

7.03 Proposal security of other Proposers whom the Buyer believes do not have a reasonable chance of receiving the award will be returned within seven days after the Proposal Opening Time.

## ARTICLE 8 -- "OR EQUAL" ITEMS

8.01 The Contract, if awarded, will be on the basis of materials and equipment, (including component equipment and Proposers equipment) specified or described in the Proposal Documents without consideration of possible "or-equal" items. Whenever it is specified or described in the Proposal Documents that an "or-equal" item of material or equipment may be furnished or used by Supplier if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the agreement. The procedure for submittal of any such application by Supplier and consideration by Engineer is set forth in the Procurement General Conditions.

8.02 Component equipment and Proposers equipment is defined in the General Conditions.

8.03 For component equipment provided by the Proposer, if the manufacturer or supplier of equipment has changed the model or component part number identified in the specifications, the current model or part number shall be used. If the manufacturer or Supplier has discontinued the model identified in the specifications, the Proposer shall base the Proposal on one of the other manufacturer(s) listed. If another manufacturer or supplier is not listed, the Proposer shall request an interpretation by the Engineer.

## ARTICLE 9 -- PREPARATION OF PROPOSAL

9.01 The Proposal Form is included with the Proposal Documents.

9.02 All blanks on the Proposal Form and Proposal Pricing Form shall be completed by printing in ink or by typewriter and the Proposal signed. A Proposal price shall be indicated for each Proposal item, alternative, or unit price item listed therein, or the words "No Proposal," "No Change," or "Not Applicable" entered. If a Proposer is requested to provide pricing on Alternatives requested by the Buyer and fails to provide such pricing, the Proposal shall be determined to be non-responsive, and shall be rejected.

9.03 A Proposal by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

9.04 All names must be typed or printed in ink below the signature.

9.05 The Proposal shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Proposal Pricing Form.

9.06 The person, address and telephone number for communications regarding the Proposal shall be shown.

9.07 Exceptions and Requests for Modifications to the Proposal Documents.

A. Proposers shall carefully review the Agreement, the Procurement General Conditions, and Warranty Sections of the Contract Documents. Proposers "Standard Terms and Conditions of Sale" will not be accepted. The Buyer will reject any Proposal that has any exceptions to the Contract Documents or any request to modify the Contract Documents.

B. The Proposer shall carefully review the provisions of the membrane warranty contained in the General Conditions and in Section 01 74 00, Membrane System and Module Warranty. Subject to the requirements of Article 15.01, the Buyer will reject any Proposal containing changes to the warranty provisions as a non-responsive Proposal.

9.08 To demonstrate Proposers Qualifications to furnish Goods and Special Services, the Proposer shall submit written evidence of the following accompanying information with the Proposal.

A. The Proposer shall provide written evidence from the surety that it can obtain the required Bonds and Insurances required by the Contract Documents.

B. The Proposer shall disclose in writing if there is any legal claim regarding a patent or other intellectual property that would affect its ability to provide the Goods or Special Services required by the Contract.

9.09 Prices offered shall include all applicable taxes and duties.

9.10 The Proposer shall submit a proposed maintenance agreement for consideration by the Buyer. The maintenance agreement shall list service types, serve type fees, labor fees, overhead rate, proposed profit margin, all charges and markups, reimbursements, and method for annual escalation. The proposed maintenance agreement shall be signed and ready for execution by the Buyer if acceptable until the time that “notice to commence fabrication” is issued.

**ARTICLE 10 -- BASIS OF PROPOSAL; COMPARISON OF PROPOSALS**

10.01 Base Proposal with Alternates

A. The “Base Proposal” is the sum stated in the Proposal for which the Proposer offers to furnish the Goods and Special Services described in the Proposal Documents as the base, to which work may be added or from which work may be deleted for sums stated in Alternate Proposals. An “Alternate Proposal” (or Alternate) is an amount stated in the Proposal that may be added or deducted to the amount of the Base Proposal if the corresponding change in the Goods and Special Services, as described in the Proposal Documents, is accepted.

B. Proposer shall submit a Proposal for the Base Proposal and indicate the amount for each Alternate described in the Proposal Documents as set forth in the Proposal Form.

C. Discrepancies between words and figures will be resolved in favor of the words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

D. The Buyer shall only evaluate Proposals that have been determined to be responsive.

**ARTICLE 11 -- SUBMITTAL OF PROPOSAL**

11.01 The Buyer shall reject any Proposal as non-responsive if the Proposal contains any information separate or prepared as an attachment to the requested information, other than the items that have been specifically requested.

A. The Proposal shall be submitted in two sealed envelopes – Envelope No. 1 and Envelope No. 2 – which shall contain the items of information listed in Section 00 40 00, Proposal Form, Article 6. If the Seller wishes to provide two Proposals, the Seller shall mark each envelope with Option 'A' or Option 'B', respectively.

11.02 Proposal must be received by the Buyer no later than the Proposal Closing Time at the place indicated in the Request for Proposals. If a Proposal is sent by mail or other delivery system, the sealed envelopes shall be enclosed in a separate envelope plainly marked on the outside with the notation "MEMBRANE PROPOSAL ENCLOSED." Inside this sealed envelope shall be the two separate sealed envelopes clearly marked as Envelope 1 and Envelope 2. A mailed Proposal shall be addressed to Jenny Coker, Public Works Director of Engineering, City of Sandy, 39250 Pioneer Blvd., Sandy, OR 97055. For clarity's sake, the Public Works Director is authorized and designated the requisite authority to receive proposals on behalf of the City.

11.03 Proposals delivered in person must be turned in prior to the Proposal Closing Time.

**ARTICLE 12 -- MODIFICATION OR WITHDRAWAL OF PROPOSAL**

12.01 A Proposal may be modified or withdrawn by a document executed in the manner that a Proposal must be executed and delivered to the place where Proposals are to be submitted prior to the Proposal Closing Time.

**ARTICLE 13 -- PROPOSALS TO REMAIN SUBJECT TO ACCEPTANCE**

13.01 All Proposals will remain subject to acceptance for the period of time stated in the Proposal Form, but the Buyer may, in its sole discretion, release any Proposal and return the Proposal security prior to the end of this period.

**ARTICLE 14 -- AWARD OF CONTRACT**

14.01 Responsiveness and Buyer's Reserved Rights

A. Proposals received by the Buyer will be reviewed for responsiveness. The Buyer reserves the right to reject any and all Proposals, including without limitation, non-conforming, unbalanced, or conditional or otherwise nonresponsive Proposals. The Buyer may also reject the Proposal of any Proposer if the Buyer believes that it would not be in the best interest of the Buyer to make an award to that Proposer. The Buyer also reserves the right but is not obligated to waive all informalities not involving price, time or changes in the Goods and Special Services. Finally, the Buyer reserves the right to reject all Proposals.

B. More than one Proposal for the same Goods and Special Services from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Proposer has an interest in more than one Proposal for the Goods and Special Services and shall be cause for disqualification of that Proposer and the rejection of all Proposals in which that Proposer has an interest.

14.02 Evaluation

A. In evaluating Proposals, the Buyer will consider whether or not the Proposals comply with the prescribed requirements, prices and other data, as may be requested in the Proposal Form or may be requested from Proposers prior to a Notice of Award.

B. The Buyer and the Engineer will evaluate responsive Proposals as described in Section 00 31 00, Proposal Evaluation. In evaluating Proposers for responsibility, consideration will be given to the financial strength and competency of the Proposer for the ability to supply the Goods and Services covered by the Contract Documents.

C. By submitting a Proposal, each Proposer agrees that the Buyer, in determining eligibility for the award, may consider the Proposers conduct and performance under other Contracts, financial condition, and other factors, including claims against, the Proposer, which could affect the Proposers ability to provide the Goods and Special Services. The Buyer may conduct such investigations as the Buyer deems necessary to assist in the evaluation of any Proposer and to establish the responsibility qualifications and financial ability of the Proposer to provide the Goods and Special Services in accordance with the Contract Documents to the Buyer's satisfaction within the prescribed time. The Buyer may request written clarification from the Proposer to clarify the Proposal. Subject to the statutory rights of the Proposer, the Buyer shall be the sole judge of responsiveness and reserves the right to reject the Proposal of any Proposer who does not pass any such evaluation to the sole satisfaction of the Buyer.

D. Proposers are advised that the capital cost (i.e., equipment) will be used in the evaluation of Proposals to determine the system cost.

E. In addition to the criteria outlined in Part 3 of Section 00 31 00, Proposal Evaluation, the Buyer will consider the following elements in evaluating Proposals:

1. The ability, capability and skill of the Proposer to perform the Contract or provide the service required; or

2. The character, integrity, reputation, judgment, experience and efficiency of the Proposer; or

3. Whether the Proposer can perform the Contract or provide the service promptly, and within the time specified without delay or interference; or

4. The performance quality of previous Contracts or services; or

5. Previous and existing compliance by the Proposer with laws relating to the Contract or service; or

6. The financial responsibility of the Proposer to perform the Contract or provide the service; or

7. The limitations of any license the Proposer may be required to possess; or

8. The quality, availability, and the adaptability of the product or service; or

9. The ability of the Proposer to provide future maintenance and service; or

10. Other information as may be pertinent and having a bearing on the decision to award the Contract; or

11. Compatibility and uniformity with existing equipment, services and procedures.

14.03 Intent to Award, Right to Protest

A. Upon completion of its evaluation, the Buyer will provide written Notice of Intent to Award to all Proposers.

B. Proposers may protest the Notice of Intent to Award. Only those who have protested the Notice of Intent to Award may protest a Notice of Award. All protests are subject to the Buyer's public Contracting rules.

14.04 Contract

A. Contract, if awarded, will be awarded to the best responsive and responsible Proposer, consistent with the Buyer's public Contracting rules and the request for Proposals, including these instructions for Proposers.

**ARTICLE 15 -- CONTRACT SECURITIES**

15.01 Article 4 of the Procurement General Conditions sets forth the Buyer's requirements as to Performance and other bonds and insurance. When the Successful Proposer delivers the executed Agreement to the Buyer, it must be accompanied by the required Performance and other Bonds.

**ARTICLE 16 -- EXECUTION OF AGREEMENT**

16.01 The successful Proposer shall sign and deliver the required number of copies of the agreement with attached documents to the Buyer within 15 days of receipt.

**ARTICLE 17 -- CONTRACT TO BE ASSIGNED**

17.01 Paragraph 11.2 of the agreement provides for the assignment of the Contract for furnishing Goods and Special Services covered by these Proposal Documents to a Contractor designated by the Buyer to construct the facilities and install the goods. Forms for documenting the assignment and for the agreement of the Seller's surety to such assignment are included as attachments to the agreement.

END OF SECTION

# SECTION 00 31 00 PROCUREMENT PROPOSAL EVALUATION

## PART 1 -- NOT USED

## PART 2 -- NOT USED

## PART 3 -- RFP EVALUATION CRITERIA

3.01 Responsive proposals will be evaluated in accordance with the requirements stated in this solicitation and any addenda issued. Evaluation of Proposals shall be accomplished by an evaluation team, which will determine the rankings of proposals. Each proposal will initially be evaluated only considering the contents of Envelope 1 for comparison of qualifications, experience, capabilities and capacity and scored accordingly. Once all proposals are evaluated and scored on the contents of Envelope 1, the evaluation team will then examine and score the contents of Envelope 2. The composite scores of Envelope 1 and Envelope 2 will be used as the basis for award to the highest combined scoring proposal.

3.02 In general, the information contained in Envelope No. 1 will be evaluated on: parent company qualifications, membrane system supplier qualifications, membrane fiber/module qualifications, and membrane system qualifications.

3.03 Envelope No. 2 will contain the membrane system capital cost information, the additive bid items and a detailed list of exemptions, exclusions, or assumptions not included from the technical specifications.

3.04 NOTE: Scoring within these categories is not limited to review of proposal information, but shall include, prior SOQs provided by each proposer, known operational facilities, references, and balance of plant evaluation.

The Buyer, at its sole discretion, may elect to select the top-scoring Proposers for an oral presentation.

The Buyer may contact any proposer for clarification of any portion of Proposer’s proposal.

3.05 Evaluation Categories:

| | | |
|---|---|---|
| ENVELOPE 1 SCORING CRITERIA | | |
| PARENT COMPANY AND ORGANIZATION INFORMATION | = | 5 POINTS |
| MSS COMPANY AND ORGANIZATION INFORMATION | = | 15 POINTS |
| MEMBRANE FIBER AND MODULE INFORMATION | = | 20 POINTS |
| MEMBRANE SYSTEM INFORMATION | = | 30 POINTS |
| TOTAL FOR ENVELOPE 1 | = | 70 POINTS |
| ENVELOPE 2 SCORING CRITERIA | | |
| TOTAL CONTRACT PRICE (ITEM 4 IN SPECIFICATION 00 41 00) | = | 20 POINTS |
| DETAILED LIST OF EXCEPTIONS, EXCLUSIONS, OR ASSUMPTIONS | = | 10 POINTS |
| ADDITIVE BID ITEMS | = | 0 POINTS |
| TOTAL FOR ENVELOPE 2 | = | 30 POINTS |
| TOTAL FOR PROPOSAL (ENVELOPE 1 + ENVELOPE 2) | = | 100 POINTS |

3.06 PURCHASE ORDER AWARD CONDITIONS

A. The information contained in Envelope No. 1 will be evaluated and utilized to rank the Proposers in order of preference before opening Envelope No. 2. The evaluation team will consist of representatives of the Buyer. Buyer will then open Envelope No. 2 and assign points for capital cost, based on the following:

1. Lowest price to receive full 20 points

2. Mathematical difference between lowest price and another Proposer price is divided by the lowest price to arrive at a value that is then subtracted from 1.00. This resultant value will then be multiplied by the 20 points to determine the assigned points to other Proposers price.

B. If Buyer is able to reach agreement with preferred Proposer on scope, schedule, and pricing, then Buyer will move forward with the preferred Proposer.

C. If Buyer is unable to reach agreement with preferred Proposer on scope, schedule and pricing then Buyer will formally notify preferred Proposer of Buyer's intent to initiate discussions with second Proposer. If Buyer is able to reach agreement with second Proposer on scope, schedule, and pricing, then Buyer will move forward with second Proposer. If Buyer is unable to reach agreement with second Proposer on scope, schedule, and pricing, then Buyer may 1) reopen negotiations with one or both of the Proposers or 2) Buyer may discontinue RFP process and select neither Proposer.

END OF SECTION

# SECTION 00 40 00 PROPOSAL FORM

**PROPOSAL FOR:**
CITY OF SANDY, OREGON. ALDER CREEK UPGRADE PROJECT

## ARTICLE 1 – PROPOSAL RECIPIENT

1.01 THIS PROPOSAL IS SUBMITTED TO:

City of Sandy, OR
Attn: Jenny Coker, PE, Public Works Director.
Address: 39250 Pioneer Boulevard, Sandy, OR 97055
Phone: (503) 668-6927
Email: Jcoker@ci.sandy.or.us

## ARTICLE 2 – PROPOSER'S ACKNOWLEDGEMENTS

2.01 The undersigned Proposer proposes and agrees, if this Proposal is accepted, to enter into an Agreement with the Buyer, in the form included in the Proposal Documents, to furnish the Goods and Special Services as specified or indicated in the Proposal Documents for the prices and within the times indicated in this Proposal and in accordance with all other terms and conditions specified in the Proposal Documents.

2.02 Proposer accepts all of the terms and conditions of the Proposal Documents, including and without limitation, those dealing with the disposition of Proposal security. The Proposal will remain subject to acceptance for 90 days after the Proposal Closing Time, or for such longer period of time that Proposer may agree to in writing upon request of the Buyer.

2.03 Proposer accepts the provisions of the Agreement for liquidated damages in the event of its failure to furnish the Goods and Special Services in accordance with the schedule set forth in the Agreement.

2.04 Proposer accepts the provisions of the Agreement for assignment of the Contract for furnishing Goods and Special Services.

2.05 Proprietary Membrane System Proposers Acknowledgements

A. The Proposer acknowledges that it is the intent of the Proposal Documents to allow the Buyer to select a Proposer that will provide Goods and Special Services that conforms to the requirements of the Procurement Documents.

B. The Proposer acknowledges that they are a provider of membrane filtration equipment that incorporates proprietary design features. The Proposer recognizes that because of the inherent differences in the proprietary membrane equipment, the Proposal Documents include both equipment that is proprietary to the Proposer and requirements for equipment that is used in municipal membrane water treatment plants.

C. The Proposer acknowledges that during the development of the Proposal Documents, the Proposer has established design (i.e., capacity, membrane flux, redundancy), operational (i.e., energy, chemicals, chemical cleaning intervals,) and equipment requirements specific to the Proposer. The Proposer recognizes that the establishment of such design criteria is based upon the results of professional judgment and treatment of other similar water with site-specific considerations of the Buyer.

D. The Proposer acknowledges that it has reviewed the design criteria and that the Proposal offered will meet the design and operational criteria as described in the Proposal Documents. In submitting the Proposal, the Proposer agrees to provide Goods to meet or exceed the requirements required by the Proposal Documents.

E. The Proposer acknowledges that in accordance with Article 14 of Section 00 20 00, Instructions to Proposers, the Buyer has reserved its rights.

F. The Proposer acknowledges that the selection of a proprietary membrane equipment supplier (Proposer) is the sole decision of the Buyer and such decisions are final.

2.06 The Proposer accepts that the Contract Price offering for Special Engineering Services is fair and reasonable.

2.07 The Proposer accepts that the Buyer retains the right to issue a “Notice to Commence Fabrication” for the Membrane Filtration System. The Proposer acknowledges that until the “Notice to Commence Fabrication” is issued, the Buyer is not obligated to any monetary commitment associated with this Contract beyond that which is associated with Special Engineering Services and Pilot Testing.

A. A “Notice to Commence Fabrication” may be issued at any time for a period of 365 days after the Effective Date of the Agreement.

B. Upon the issuance of the “Notice to Commence Fabrication” the Contract Price for Membrane Units and Ancillary Equipment shall remain valid until 365 days after the Effective Date of the Agreement. If the Notice to Commence Fabrication is issued after 365 days of the Effective Date of the Agreement, the Contract Price will be adjusted through Change Order by the ratio of the Consumer Price Index (CPI) of the CPI of month that the Notice to Commence Fabrication is issued to the CPI of the month 365 days after the Effective Date of the Agreement.

Clarification: should be changed to match 00 52 00 Article 6.01.C proposing PPI to address price escalation, 200 days after date of agreement

2.08 The Proposer accepts that if the Proposer submits a Membrane Module Warranty Period in excess of 120-months, the Proposal shall be rejected as non-responsive with the requirements of the Proposal Documents.

2.09 Proposer acknowledges that their Proposal is being submitted to a public agency and that the Proposal will become public information as of the Proposal Closing Time. Additionally, the Proposer acknowledges that the Proposal and subsequent Proposal evaluation and recommendations to award a contract will become public information. In submitting this Proposal, the Proposer waives all rights pertaining to the confidentiality of documents whether or not specifically stated or implied. Exceptions will be a basis for declaring the Proposal non-responsive. If a Proposal contains any information that the Proposer believes is exempt from disclosure under the various grounds specified in the Oregon Public Records Law, the Proposer must clearly designate each such portion of its proposal as exempt at the time of proposal submission, along with a justification and citation to the legal authority relied upon. Identifying the Proposal, in whole, as exempt from disclosure is not acceptable. Failure to identify specific portions of the Proposal as exempt shall be deemed a waiver of any future claim of that information as exempt. The City will make available to any person requesting information, through the City processes for disclosure of public records, any and all information submitted as a result of this RFP not exempted from disclosure without obtaining permission from any Proposer to do so. City may also, in its sole discretion, elect to publish all such information at any time, regardless of whether or not a public records request has been received. However, if a public records request is made for material marked by the Proposer as exempt, the City will attempt to notify the impacted Proposer prior to any release of the material. Application of the Oregon Public Records Law by the City will determine whether any information is actually exempt from disclosure. The City accepts no liability for the release of any information submitted.

2.10 The Proposal shall be based upon design criteria, including maximum membrane flux established in the membrane procurement documents.

2.11 The Proposal Pricing shall include all applicable taxes and duties.

## ARTICLE 3 – PROPOSER'S REPRESENTATIONS

3.01 In submitting this Proposal, Proposer represents, as set forth in the Agreement, that:

A. Proposer has examined and carefully studied the Proposal Documents, the other related data identified in the Proposal Documents, and the following Addenda, receipt of which is hereby acknowledged.

| ADDENDUM NO. | ADDENDUM DATE |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

B. If specified, or if in Proposers judgment, any local condition may affect cost, progress or the furnishing of Goods and Special Services, Proposer has visited the Point of Destination and become familiar with and is satisfied as to the local conditions that may affect cost, progress, or the furnishing of Goods and Special Services.

C. Proposer is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of Goods and Special Services.

D. Proposer has carefully studied and correlated the information known to Proposer, and information and observations obtained from Proposers visits, if any, to the Point of Destination with the Proposal Documents.

E. Proposer has given Buyer written notice of all conflicts, errors, omissions, ambiguities, or discrepancies that Proposer has discovered in the Proposal Documents, and the written resolution thereof by Buyer is acceptable to Proposer.

F. The Proposal Documents are sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Proposal is submitted.

G. Proposer further represents that this Proposal is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Proposer has not directly or indirectly induced or solicited any other Proposer to submit a false or sham Proposal; Proposer has not solicited or induced any individual or entity to refrain from Proposal; and Proposer has not sought by collusion to obtain for itself any advantage over any other Proposer or over the Buyer.

**ARTICLE 4 – BASIS OF PROPOSAL**

4.01 Refer to Section 00 41 00, Proposal Pricing Form.

**ARTICLE 5 – TIME OF COMPLETION**

5.01 Proposer agrees that the furnishing of Goods and Special Services will conform to the schedule set forth in Article 5 of the Agreement.

**ARTICLE 6 – ATTACHMENTS TO THIS PROPOSAL**

6.01 Proposals must include submission of two sealed envelopes – Envelope No. 1 and Envelope No. 2 – as detailed below and must follow the additional requirements in Article 9 of Section 00 20 00, Instructions to Proposers to be considered responsive..

A. Sealed Envelope No. 1:

1. Required Proposer qualifications statement, accompanying information and supporting data, including:

   a. The completed Proposal Form (Section 00 40 00, Proposal Form)

   b. The completed Proposal Bond (Section 00 61 27, Proposal Bond)

   c. The evidence of the authority to sign.

   d. The draft pilot test plan, per Section 11 30 20, Performance Pilot Testing of Membrane Equipment.

2. The Seller (Membrane System Supplier or MSS) company and organization information

   a. Provide the following information on the Seller (MSS) portion of the parent company, and the parent company itself, as appropriate:

      1) Parent Company:

         a) A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year.

         b) Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.)

         c) The most recent independent audit report.

         d) Experience in the municipal water and wastewater treatment industry, both in the United States and internationally, and evidence of commitment to the municipal market.

e) Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company.

f) Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend.

2) Seller MSS Company:

a) A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year.

b) Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.)

c) The most recent independent audit report.

d) Documented experience gaining approval for municipal installations through Oregon Health Authority

e) A description of the manufacturing facilities, their current and projected capacities; and their ability to meet delivery of 2 mgd systems in 2024-2025.

f) A minimum of three financial references with phone numbers; and, upon request of the City, each prospective proposer shall provide written authorization for such references to provide financial information to the City.

g) Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company.

h) Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend.

b. Membrane fiber and module information

1) Provide the following information on the membrane fiber and module proposed for use on this project:

a) Identified Membrane Element Manufacturer (MEM)

b) Documented experience of MEM treating surface water in western Washington and Oregon

c. Membrane system information

1) Provide the following information on the membrane filtration system proposed for use on this project:

a) A complete list of representative operational installations (with the product you have proposed for this project) within previous 10 years. Include the following information:

i. Plant Location

ii. Plant capacity

iii. Date of installation (equipment startup)

iv. Source water characteristics (i.e., secondary effluent, lake, reservoir, river, etc.). Clearly identify applications using coagulant addition for removal of phosphorus from municipal secondary effluent.

v. Type of pretreatment (coagulant, dose, type of pretreatment).

vi. Contact names, phone, e-mail. Proposer grants the City the right to contact any reference provided.

d. Identification and Qualifications of MSS's Project Manager and Resident Representative:

a) For the MSS's proposed project manager and resident representative (for Phase III – Post Operational Performance Test), provide name and resume listing applicable experience and references.

b) The MSS's project manager shall serve as the primary contact for the Buyer's project from receipt of Proposal through facility startup.

c) The MSS's project manager shall not be changed without the written consent of the Buyer and the Engineer.

d) Provide similar information for a designated secondary contact.

e. Proposed Performance Schedule: A detailed schedule meeting all of the requirements of Article 5 in Section 00 52 00, Procurement Agreement.

f. Project Delivery Plan:

1) A detailed plan for the delivery including the following elements at a minimum:

a) Engineering Services as described in Section 01 01 00, Summary of Goods and Special Services:

i. Identify engineering staff

ii. Level of effort

iii. Schedule

iv. Quality Assurance/Quality Control plan

v. Change Management Plan

vi. Communication Plan

b) Fabrication

i. Describe Proposer's plan to maintain and communicate schedule as it pertains to fabrication of the membrane system. What is Proposer's plan if fabrication schedule slips?

c) Installation Services

i. Describe Proposer's plan to meet the service requirements of Section 01 62 00, Installation of Membrane Equipment and Section 01 73 00, Installation, Operation and Maintenance Manuals.

d) Training

i. Describe Proposer's plan to meet the training requirements outlined in Section 01 73 10, Training of Operation and Maintenance Personnel.

e) Commissioning

i. Describe Proposer's plan to meet the commissioning requirements outlined in Section 01 66 00, Commissioning of Membrane Equipment.

f) One-Year onsite services as specified in 01 67 00, Acceptance Testing of Membrane Equipment.

i. Identify onsite and in office support staff

ii. Level of effort

iii. Quality Assurance/Quality Control plan

iv. Change Management Plan

v. Communication Plan

g. Verification of Performance Requirements

1) Performance Requirements:

a) Production Capacity: Confirm that the system will meet production capacity requirements for the range of feedwater quality stated in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

b) Membrane System Recovery: Verify conformance with the membrane system recovery requirements of Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

c) Membrane Filtered Water Quality: Confirm that system will meet requirements for membrane filtered water quality stated in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

d) Membrane Integrity Test System (MITS):

i. Describe monitoring parameters, instrumentation, and alarm thresholds for the online membrane integrity system.

ii. Describe verification, identification, and isolation procedures.

iii. Provide documentation describing the calculation of pathogen log removal values from the system based on the decay test results.

iv. State the time required to perform a MIT on each membrane train and the membrane system.

e) Pretreatment System Compatibility:

i. Provide certification that the proposed membrane system is compatible with the addition of chemicals to the feedwater as described in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

ii. Identify any limits to the concentration, contact time, or product thereof (e.g., ppm-hours) for any of the potential pretreatment chemicals listed in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System. If no adverse impacts are expected, so state.

h. Operations Descriptions:

a) Describe procedures for access, inspection, removal, repair, and replacement of membrane modules.

b) Describe startup and normal operation procedures, as well as methods for maintaining and recovering membrane system permeability (backwashing, maintenance cleans, CIPs, tank draining, etc., as applicable).

c) Shutdown/Storage/Startup:

i. Describe procedures for complete shutdown, storage of the membranes and related equipment, and startup.

ii. Detail process equipment necessary to accomplish storage of the plant.

iii. Detail chemical(s) required and estimated annual use for storage.

iv. Detail chemical(s) used for membrane delivery and storage on site during construction and recommendation for chemical(s) disposal.

v. Detail, if necessary, minimal membrane flow requirement to preserve membrane integrity during storage.

i. Statement of SCADA Software and Compatibility

a) Identify MSS's standard PLC applications software and SCS applications software.

b) Identify alternate SCS software systems, if any, utilized by MSS.

3. Letter from Proposer's surety company indicating Proposer is willing and able to provide the specified Payment and Performance Bonds.

4. Letter from Proposer's surety company indicating Proposer is willing and able to provide a separate bond to cover Warranty obligations through the Warranty period.

5. Letter from Proposer's insurance broker indicating Proposer is willing and able the specified Insurance.

6. Letter from an officer of Proposer's firm stating that Proposer takes no exceptions to the Form of Agreement.

7. A complete copy of the Proposal Documents, including Addenda. The front cover of each Volume of the Proposal Documents and Addenda shall be signed and dated by the individual designated in the Proposal Form. The documents shall be otherwise unaltered.

B. Sealed Envelope No. 2:

1. The completed Proposal Pricing Form (Section 00 41 00, Proposal Pricing Form)

2. Additive bid item for additional capacity; see Section 11 30 00, Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

3. Additive bid item for membrane container storage pricing.

a. If the Buyer is unable to accept and store the membrane containers, the Seller shall provide a service for storing the containers at a secure location. Buyer shall provide a price per month of storage, for up to 6 months.

Clarification/exception: "Provided H2OI is required to store the UF containers at its facility resulting from buyer's request to extend originally agreed upon delivery dates, a monthly storage fee of $3,000 will be applied."

**ARTICLE 7 – DEFINED TERMS**

7.01 The terms used in this Proposal have the meanings indicated in the Procurement General Conditions. The significance of terms with initial capital letters is described in the Procurement General Conditions.

**ARTICLE 8 – PROPOSAL SUBMITTAL**

8.01 Respectfully submitted on (date) _____

This Proposal is submitted by:

## Corporation

(Corporation Name)

(State of Incorporation)

(Signature of Officer Authorized to Sign)

(Printed or Typed Name and Title of Officer Authorized to Sign)

(CORPORATE SEAL)

(Signature of Attesting Party)

(Printed or Typed Name Attesting Party)

(Corporation Business Address)

(Phone No.)

Person to whom notices and correspondences regarding this Proposal should be addressed to:

(Corporation Business Address)

(Phone No.)

END OF SECTION

**SECTION 00 41 00**

**PROPOSAL PRICING FORM**

PROJECT TITLE: Alder Creek Water Treatment Plant Upgrade (Project)

THIS BID IS SUBMITTED TO:

City of Sandy (as Buyer):
39250 Pioneer Boulevard
Sandy, OR 97055
Attn: Jenny Coker
(505) 668-6927
Jcoker@ci.sandy.or.us

The undersigned Seller having carefully examined the drawings, specifications, and all addenda thereto, and other Procurement Documents for furnishing Goods and Special Services for Project, and become familiar with all local conditions including labor affecting the cost thereof, does hereby propose to furnish all labor, mechanics, superintendence, tools, materials, equipment and all utilities, fuel, transportation, applicable taxes and duties, and services necessary to perform and complete said work, and work incidental thereto, in a workmanlike manner, as described in the Procurement Documents, in accordance with the bid prices hereinafter set forth.

Note: Unit and lump sum prices must be shown in words and figures in the proposal for each item being bid and in the event of discrepancy, the words shall control.

**Envelope 2 - Procurement of Membrane Filtration Equipment and Special Services**: Capital costs for complete Membrane System as specified in the procurement documents and drawings for the Project.

**CONTRACT PRICES FOR PROCUREMENT OF MEMBRANE FILTRATION EQUIPMENT AND SPECIAL SERVICES**

**Item 1: Price for Performance Pilot Test**

The Contract Price for the Pilot Study has been determined by the Buyer as fair and reasonable.

**Seventy-Five Thousand Dollars and no cents**
**($ 75,000.00)**

**Item 2: Price for Special Engineering Services**

The Contract Price for Special Engineering Services has been determined by the Buyer as fair and reasonable.

**One Hundred and Twenty-Five Thousand Dollars and no cents**
**($ 125,000.00)**

**Item 3: Contract Price for Containerized Membrane Filtration Systems including Ancillary Equipment**

_____ dollars

($ _____)

**Item 4: Total Contract Price**
*Add Items 1, 2, and 3.*

_____ dollars

($ _____)

**Item 5: Membrane Module Price***

Indicate the Membrane Module Price in current dollars as of the Proposal Opening Time.

_____ dollars

($ _____)

**Item 6: Indicate the Proposer's maximum instantaneous membrane flux (see notes)**

_____ Gallons/ ft2-day **(words)**

_____ Gallons/ ft2-day **(number)**

Notes:
1). Maximum membrane flux shall be calculated using the feed side of the membrane proposed by the Proposer as an instantaneous value. Any proposal with maximum membrane flux exceeding 60.0 gallons/ ft2-day will be rejected by the Buyer.

2). Maximum membrane flux does not include the contractual requirements for redundancy and reliability.

**Item 7: Indicate the number of membrane modules per membrane unit proposed**

_____ **(words)**

_____ **(number)**

Per Paragraphs 2.08 and 2.09 of the Proposal Form, indicate the Membrane Module Warranty Period (Full and Pro-Rata Replacement) in months.

120 months

~~**Item 7: Membrane Module Pricing Mechanism***~~

~~Per Paragraph 2.08 of the Proposal Form, the Proposer shall indicate if membrane module pricing is fixed or variable with the CPI. Proposer shall indicate the method by writing the words "fixed membrane module price" or "variable with CPI membrane module price" in the space below.~~ **[Addendum #3]**

Addendum 2: Item 7 removed

**Item 8: Container Monthly Storage Price – Additive Bid item**

Per Paragraph 6.01 of the Proposal Form, the Proposer shall indicate pricing for monthly storage of membrane containers.

**dollars/month**

**($ )**

**Item 9: Additional Capacity – Additive Bid item**

Per Paragraph 6.01 of the Proposal Form and Section 11 30 00, Containerized Hollow Fiber Membrane Equipment Membrane Treatment System, the Proposer shall indicate pricing for additional capacity.

**dollars**

**($ )**

**PERFORMANCE, PAYMENT, AND MAINTENANCE BOND**

The Undersigned agrees, if awarded the Procurement Agreement, to furnish bonds as required by the Procurement Documents for the faithful performance of the furnishing of Goods and Special Services under the Procurement Agreement.

**PROPOSAL SECURITY**

Proposal security consisting of certified check, cashier's check, or bid bond (Section 00 61 27, Proposal Bond) and made payable to Buyer, in the amount of $_____, which represents five (5) percent of the Total Amount Bid, is enclosed herewith.

Proposal security consisting of certified check, cashier's check, or bid bond (Section 00 61 27, Proposal Bond) and made payable to Buyer, in the amount of $_____, which represents five (5) percent of the Total Amount Bid, is enclosed herewith.

The proposal security accompanying this proposal shall be returned to the Seller unless, in case of the Buyer's acceptance of the Proposal, the Seller fails to execute the Procurement Agreement and submit performance and payment bonds within 15 days after its acceptance. In such a case, the Proposal Security shall become the property of the Buyer and shall be considered as payment for damages due to delay and other inconveniences suffered by the Buyer on account of such failure of the Seller. It is understood that the Buyer reserves the right to reject any and all proposals.

**RESPECTFULLY SUBMITTED ON (DATE)** _____
This Proposal is submitted by:

**Corporation**

_____
(Corporation Name)

_____
(State of Incorporation)

_____
(Signature of Officer Authorized to Sign)

_____
(Printed or Typed Name and Title of Officer Authorized to Sign)

_____
(CORPORATE SEAL)

_____
(Signature of Attesting Party)

_____
(Printed or Typed Name of Attesting Party)

_____
(Corporation Business Address)

_____
(Phone No.)

_____
(Person to Whom Notices and Correspondence Regarding This Proposal Should Be Addressed)

_____
(Corporation Business Address)

_____
(Phone No. and Email Address)

**END OF SECTION**

1.01 Clarification: proposed offer is 2 trains in container 1 [illegible]ain in container 2, meeting 2.0 mgd with one train out of service



# SECTION 00 52 00 PROCUREMENT AGREEMENT

This agreement is between the City of Sandy ("Buyer") and _____ ("Seller").

## ARTICLE 1 – RECITALS

1.01 The Project for which the Goods and Special Services are to be provided under the Contract Documents is generally described as follows: City of Sandy Alder Creek Water Treatment Plant Upgrade Project that will include an on-site proof of performance pilot test and furnishing a complete set of two (2) hollow fiber membrane containers each with a firm capacity of 2.0 mgd.

1.02 The Seller manufactures membrane filtration systems used in water treatment plants.

1.03 Seller shall furnish the Goods and Services as specified or indicated in the Contract Documents.

## ARTICLE 2 -- GOODS AND SPECIAL SERVICES

2.01 The Seller shall provide and operate a membrane filtration pilot system on the buyer's Alder Creek water treatment plant site to validate the Seller's membrane filtration media and system, design parameters, and operating guarantees. If the Buyer determines that the pilot test is successful, the Buyer will provide the Seller with written notice. The Buyer reserves the right to evaluate the Seller's performance during the pilot study and use that as a basis for evaluating successful completion.

2.02 The Buyer will execute the Agreement, subject to Seller's exceptions herein, and administer the Contract for Special Engineering Services associated with the preparation of Shop Drawings and other Submittals required for the project.

2.03 The Buyer is not obligated under this Agreement beyond Special Engineering Services and pilot testing until it issues a "Notice to Commence Fabrication" to the Seller. A Notice to Commence Fabrication may be issued at any time for a period of 365 days after the effective date of the Agreement.

2.04 Upon "Notice to Commence Fabrication" from the Buyer to the Seller, the Seller shall then:

A. Fabricate and deliver membrane filtration equipment and ancillary components (the "Goods") to the Facility,

B. Assist during installation and commission the Goods,

C. Deliver operational and maintenance manuals,

D. Provide operations assistance for one year after installation of the Goods, and

E. Warranty the membrane modules and system per the Contract Documents.

2.05 The Buyer retains the right to assign the remaining portion of the work, which includes the production, delivery and commissioning of the goods and all associated Special Services, to a Contractor.

2.06 The Seller shall deliver the required Bonds and insurance certificates in accordance with Article 4 of the General Conditions.

A. At the time of the effective date of the Agreement, a Performance Bond shall be provided for the Special Engineering Services for the full amount stated in Proposal.

B. Another Performance Bond and the Payment Bond shall be provided upon issuance of the "Notice to Commence Fabrication" in the full amount of the stated amount in Proposal.

2.07 The Buyer retains the right to terminate this Agreement after the pilot test and contract with another entity to provide membrane filtration equipment for the Facility.

## ARTICLE 3 – ENGINEER

3.01 The Contract Documents were prepared by Stantec Consulting Services Inc., 601 SW 2nd Ave, Suite 1400, Portland, OR 97204, Attn: Adam Odell, PE, Adam.Odell@stantec.com, 503.220.5409, hereinafter called "Engineer" and who is to assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents.

## ARTICLE 4 – POINT OF DESTINATION

4.01 The Goods shall be delivered to the point of destination: The Alder Creek Water Treatment Plant, which contains no known address, but is accessible from a private gravel road in between Whiskey Creek Rd. and E. Terra Fern Drive 7 miles east of Sandy, OR.

## ARTICLE 5 – CONTRACT TIMES

5.01 TIME IS OF THE ESSENCE

A. All time limits for Milestones for the delivery of Goods and the furnishing of services as stated in the Contract Documents are of the essence of the Contract.

5.02 DAYS TO ACHIEVE THE PROOF OF PERFORMANCE PILOT TEST

A. The dates for the pilot study are set forth in the following table:

| Item No. | Pilot Study Contract Time | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|---|
| | **Pilot Study** | | |
| A | Draft Work Plan | With Proposal | |
| B | Final Work Plan | Receipt of Engineer's Comments | 7 |
| C | Deliver pilot equipment | Effective Date of Agreement | 14 |
| D | Have Pilot Plant Operational at site | Effective Date of Agreement | 28 |
| D | Complete pilot study program | Effective Date of Agreement | 118 |
| E | Submit Draft Pilot Summary Report | Effective Date of Agreement | 118 |

| | | | |
|---|---|---|---|
| F | Submit Final Pilot Summary Report | Receipt of Engineer's Comments | 14 |

## 5.03 DAYS TO ACHIEVE SUBMITTAL OF SHOP DRAWINGS AND SAMPLES

A. All Shop Drawings and Samples required by the Contract Documents will be submitted to the Buyer for Engineer's review and approval in accordance with the following schedule.

**Special Engineering Services**

| Item | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. First Shop Drawing Submittal | Effective Date of Agreement | 45 |
| 2. First Shop Drawing Approval | Effective Date of Agreement | 90 |
| 3. Second Shop Drawing Submittal | Effective Date of Agreement | ~~75~~ 90 [Addendum #5] |
| 4. Second Shop Drawing Approval | Effective Date of Agreement | ~~120~~ 135 [Addendum #5] |

## 5.04 DAYS TO ACHIEVE DELIVERY OF GOODS

A. The Goods are to be complete and ready for the Buyer's receipt of delivery at the Facility in accordance with the following schedule:

**Goods**

| Item | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. Goods, excluding Computer Equipment, Membrane Modules, and Spare Parts | Notice to Commence Fabrication | 240 |
| 2. Computer Equipment | Notice of Completed Installation | 10 |
| 3. Membrane Modules | Notice of Completed Installation | 14 |
| 4. Spare Parts | Notice of Completed Installation | 30 |

1. The Seller shall not start to manufacture any Goods until the Shop Drawings have been approved and the Buyer has issued a "Notice to Commence Fabrication." The Goods, excluding the membrane modules, are to be fabricated and ready for delivery prior to 315 ~~240~~ 340 [Addendum #5] days after the "Notice to Commence Fabrication" is issued.

2. The Seller shall hold the spare parts, membrane modules and computer equipment and deliver to the Facility for installation during commissioning. The spare parts, computer equipment and membrane modules will be delivered in a timely manner as not to impede or delay the commissioning.

3. Long lead items may be purchased prior to "Notice to Commence Fabrication" if approval from Buyer is obtained. [Addendum #5].

## 5.05 PROJECT MILESTONES FOR SPECIAL SERVICES AND SELLER'S WARRANTEE AND GUARANTEE

A. The furnishing of Special Services to the Buyer will commence upon the execution of the Agreement between the Buyer and the Seller. The Seller shall deliver all Special Services required by the Contract Documents based upon the following milestones.

1. Special Engineering Services

   a. Upon execution of the Agreement, the Seller will begin to provide Special Engineering Services required for Shop Drawings and Samples.

2. Special Services

a. Upon the issue of a Notice to Commence Fabrication, the following Contract Times will commence.

**Special Services**

| Contract Time | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. Installation Manuals | Notice to Commence Fabrication | 150 |
| 2. Commissioning | Notice of Completed Installation | 30 |
| 3. Operator Training | Notice of Completed Commissioning | 15 |
| 4. Preliminary O&M Manual | Notice of Completed Installation | 15 |
| 5. Acceptance Testing | Notice of Completed Operator Training | 45 |
| 6. Final O&M Manual | Notice of Substantial Completion | 45 |
| 7. Warranty Period | Notice of Substantial Completion | 365 |

b. Operational and Maintenance Manuals shall be delivered at the times indicated in Section 01 73 00, Installation, Operations and Maintenance Manuals.

c. In accordance with Section 01 62 00, Installation of Membrane Equipment, Special Services associated with the Installation of the Goods, shall commence with the delivery of the Goods and shall be completed when the “Notice of Completed Installation” is issued by the Engineer.

d. In accordance with Section 01 66 00, Commissioning of Membrane Equipment, commissioning shall commence after the “Notice of Completed Installation” is issued and associated work has been completed. Upon completion of commissioning, a “Notice of Completed Commissioning” will be issued by the Engineer.

e. In accordance with Section 01 73 10, Training of Operations and Maintenance Personnel, Operator Training shall commence after the “Notice of Completed Commissioning.” Upon completion of Operator Training, a “Notice of Training Completion” will be issued by the Engineer.

f. In accordance with Section 01 67 00, Acceptance Testing of Membrane Equipment, acceptance testing shall not commence until after the prerequisite “Notice of Training Completion” is issued. Upon completion of Acceptance Testing, the “Notice of Substantial Completion” will be issued by the Engineer.

g. In accordance with Section 01 68 00, Operations Assistance, operations assistance shall be provided in accordance with the requirements of that Section. The Correction Period shall commence on the date when the “Notice of Substantial Completion” is issued.

B. For the purposes of Seller’s warranty and guarantee, the following Project milestones are as follows:

1. In accordance with Section 01 74 00, Membrane System and Module Warranty, the Membrane Module Warranty Period shall commence on the date when the Acceptance Testing first begins.

Exception - membrane system warranty commences 12 months from startup/commissioning or 18 months after equipment delivery, whichever comes first.
Membrane module warranty commences when water first touches UF modules or 6 months after shipping, whichever comes first.

2. The Correction Period shall commence on the date the “Notice of Substantial Completion” is issued.

5.06 LIQUIDATED DAMAGES

A. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if the Special Engineering Services are not delivered to the Buyer within the times specified in Paragraph 5.02, above. They also recognize that the timely performance of services by other parties involved in the Buyer’s Project are materially dependent upon the Seller’s specific compliance with the requirements of Paragraph 5.02 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable submittals are not delivered on time. Accordingly, and instead of requiring proof of such losses or damages, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty), the Seller shall pay the Buyer $2,500.00 for each day that expires after the times or dates specified in Paragraph 5.02 for deliveries of acceptable submittals. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

B. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if 1) the Goods, associated with the Membrane Filtration System are not fabricated and ready for delivery to the Buyer within the time specified in Paragraph 5.03 above, or 2) if the membrane modules are not delivered in a timely manner as stated in Paragraph 5.03 above. They also recognize that the timely performance by other parties involved in the Buyer’s Project are materially dependent upon the Seller’s specific compliance with the requirements of Paragraph 5.03 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable Goods or membrane modules are not delivered on time. Accordingly, and instead of requiring proof of such losses or damages, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty) the Seller shall pay Buyer $2,500.00 for each day that expires after the times or dates specified in Paragraph 5.03 for delays involving delivery of the Goods. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

C. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if the Special Services are not delivered in a timely manner as stated in Paragraph 5.04, above. They also recognize that the timely performance by other parties involved in the Buyer's Project are materially dependent upon the Seller's specific compliance with the requirements of Paragraph 5.04 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable Goods, membrane modules or Special Services are not delivered on time. Accordingly, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty) the Seller shall pay Buyer $1,000.00 for each day that expires after the times or dates specified in Paragraph 5.04 for delays involving delivery of the Special Services. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

D. The Buyer may deduct the amount of liquidated damages from monies due the Seller under this Agreement. Liquidated damages shall not exceed five (5) percent of the contract price.

E. The liquidated damages provided in this Section shall be Buyer's sole and exclusive remedy for Seller's late delivery of Special Engineering Services, Goods, and Special Services.

F. If Seller is prevented from achieving the delivery times, milestone submittal dates or response times as defined in Articles 5.02A.5, 5.03D, and 5.03E, for any reason beyond Seller's reasonable control and not attributable to its actions or inactions, Seller shall not be assessed liquidated damages and shall be entitled to an adjustment of the Contract Times in an amount equal to the duration of the reason or event causing the delay in delivery.

G. Upon receipt of Buyer's Notice to Commence Fabrication of Equipment that satisfies Seller's requirements for meeting the delivery schedule, Seller shall commence fabrication of equipment. The place of delivery specified therein shall be firm and fixed, provided that Buyer may notify Seller no later than 45 days prior to the scheduled shipment date of the products of an alternate point of delivery (the "Alternate Delivery Site"). Provided the parties agree to a variation to take into account any additional cost [or delay] incurred by Seller in implementing this change, the Alternate Delivery Site shall become the agreed place of delivery for all purposes under this Agreement. In such event the following conditions shall apply: (i) title and risk of loss shall pass to the Buyer upon delivery of the products to the Alternate Delivery Site; (ii) any amounts payable to the Seller upon delivery or shipment shall become payable upon delivery of the products to the Alternate Delivery Site; (iii) any additional expenses incurred by the Seller in connection with such shipment to storage shall become payable by the Buyer upon submission of the Seller's invoice(s) (including but not limited to costs of any additional transportation, preparation for and placement into storage, handling, inspection, preservation, insurance, storage, removal charges and any applicable taxes); (iv) transportation of the products from the storage facility to their place of installation shall be the Buyer's responsibility; and, (v) if the Contract includes Services, subject to the terms and conditions in the Contract the Seller shall resume provision of Services to Buyer when instructed to do so by Buyer provided that all amounts due hereunder plus any cost incurred by Seller in delaying such Services have been paid.

5.07 LIQUIDATED DAMAGES FOR PILOT STUDY

A. During the Pilot Study, should the results indicate system performance capabilities that are less than those defined in Sections 11 30 00, Hollow Fiber Membrane Equipment, the Seller shall modify its equipment to meet the minimum defined system performance capabilities, repeat the entire duration of the Pilot Study, and pay for liquidated damages to account for the loss suffered by the Buyer due to schedule delay. Liquidated damages shall be assessed at $500 per day starting at the determination of Pilot Study initial attempt failure until the commencement of the Pilot Study second attempt up to a maximum amount of $5,000. Should the second attempt of Pilot Study yield system performance results that are less than those defined herein, the Seller will be deemed non-responsive and the Buyer may begin to negotiate with the next lowest responsive Proposer.

B. The liquidated damages provided in this Section shall be Buyer's sole and exclusive remedy for Seller's failure to meet the Pilot Study requirements of this Agreement.

C. Liquidated damages shall be assessed per day of delay and in the event that there are multiple items where the Contract Times has been exceeded Liquidated Damages shall not be combined.

**ARTICLE 6 – CONTRACT PRICE**

6.01 The Buyer shall pay Seller for furnishing the Goods and Special Services in accordance with the Contract Documents in current funds as follows:

A. The prices stated in Seller's Proposal, attached hereto as an exhibit.

B. Seller shall pay all applicable taxes and duties.

C. The Contract Price for membrane units and ancillary equipment shall remain valid for 180 days after the effective date of the agreement. If the "Notice to Commence Fabrication" is issued after 180 days from the effective date of the agreement (up to a maximum of 3 years), the Contract Price will be adjusted through Change Order. Contract Price adjustment will be the ratio of the Producers Price Index (PPI) of the PPI of month that the "Notice to Commence Fabrication" is issued, to the PPI of 180 days after the effective date of the agreement.

D. Membrane modules shall be made available for purchase by the Buyer at the pricing offered in the Proposal Pricing Form and that the pricing for future membrane modules, as part of a warranty claim or replacement purchase, shall be in accordance with the methods described in 01 74 00, Membrane System and Module Warranty. Membrane Module Pricing shall remain effective for a period of 20 years after the proposal date.

E. In the event that the City (or Contractor if the Contract is assigned) does not issue the "Notice of Completed Installation" within 500 days after the "Notice to Commence Fabrication", 40 percent of the Contract Price shall be adjusted through Change Order by the ratio of the PPI of the month the "Notice of Completed Installation" to the month of 500 days after the "Notice to Commence Fabrication".

1. This Change Order mechanism is provided in the event that there is an unforeseen delay during construction. The above provision is provided as the sole compensation to the Seller for the delay in the delivery of membrane modules and applicable Special Services described in Paragraph 5.03.A of the Agreement.

2. The applicable provisions of Paragraph 5.03.A remain contractual obligations of the Seller.

F. By issuance of a Change Order, all Alternate Proposal pricing in the Proposal Form shall remain open and subject to acceptance by the Buyer for a period of 2 years after the proposal date.

**ARTICLE 7 – PAYMENT PROCEDURES**

7.01 SUBMITTAL AND PROCESSING OF PAYMENTS

A. Seller shall submit Applications for Payment in accordance with Article 13 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

7.02 PROGRESS PAYMENTS

A. Buyer shall make progress payments on account of the Contract Price on the basis of Seller's Applications for Payment as follows:

1. Progress Payments for Special Engineering Services:

a. The Buyer shall pay Seventy-Five Thousand Dollars ($75,000.00) for Pilot Testing Services provided as part Paragraph 10.01.A.1.a.1 of the General Conditions, to the Seller upon the Buyer's approval of the first Application for Payment for Pilot Testing Services, submitted in accordance with Paragraph 10.01.A.1 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 10.2.A of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

b. The Buyer shall pay One Hundred and Twenty Five Thousand Dollars ($125,000.00) for Special Engineering Services provided as part, Paragraph 10.01.A.1.a.2 of the General Conditions to the Seller upon the Buyer's approval of the Application for Payment for Special Engineering Services, submitted in accordance with Paragraph 10.01.A.1 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 10.02.A of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

2. Progress Payments for Goods and Special Services.

a. The Buyer shall make progress payments on the Total Contract Price for Goods and Special Services in accordance with Article 10 of the General Conditions and based upon the following schedule:

**Payment Schedule**

| Payment | Contract Milestone(s) | Percentage of Total Contract Price |
|---|---|---|
| First Application | Notice to Commence Fabrication | 75 |
| Second Application | Delivery of Goods | 90 |
| Final Application | Notice of Substantial Completion | 100 |

b. The Buyer shall pay the above percentages of the Total Contract Price provided as part Paragraph 13.01 of the General Conditions to the Seller upon the Buyer's approval of the Application for Payment, submitted in accordance with Paragraph 13.01 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 13.02 of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 13.02 of the General Conditions.

c. The Total Contract Price is the Total Contract Price as indicated in the Proposal Pricing Form as adjusted through change order less liquidated damages assessed as part of the Contract.

7.03 FINAL PAYMENT

A. Upon the Buyer's approval of the final Application for Payment, accompanied by the Engineer's recommendation for payment in accordance with Article 13 of the General Conditions, the Buyer shall make the final payment to bring the total payment to 100 percent of the Contract Price as adjusted for changes to the Contract Price or less any prior payments to the Seller. This payment, at the Engineer's recommendation, may be less such amounts, as Engineer shall determine in accordance with the Agreement or any applicable provisions of the General Conditions.

B. The Final Payment shall be accompanied by a "Notice of Contract Completion" executed by both parties.

**ARTICLE 8 -- INTEREST**

8.01 Subject to the provisions of Article 13 of the General Conditions, all monies not paid within 60 days after the receipt of the Seller's Application for payment shall accrue interest at the rate of the 6 percent per annum.

Clarification/ exception: change 6% to 8%

**ARTICLE 9 - SELLER'S REPRESENTATIONS**

9.01 In order to induce Buyer to enter into this Agreement, Seller makes the following representations:

A. Seller has examined and carefully studied the Contract Documents and the other related data identified in the Proposal Documents.

B. If specified or if, in Seller's judgment, any local condition may affect cost, progress or the furnishing of the Goods and Special Services, Seller has visited the Facility location and become familiar with and is satisfied as to the local conditions that may affect cost, progress or the furnishing of the Goods and Special Services.

C. Seller is familiar with and is satisfied as to all local federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of the Goods and Special Services.

D. Seller has carefully studied and correlated the information known to Seller, and information and observations obtained from Seller's visits, if any, to the Point of Destination, with the Contract Documents.

E. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Seller.

F. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Special Services.

G. The Seller has provided test data from either full-scale operation(s) or pilot test data from facilities of similar water quality to the Project as information and design concepts for its proprietary membrane system. In providing the information and design concepts for this Project, the Seller has considered and incorporated the concept of "linear scalability" into its design. Linear scalability means that: 1) the Seller has considered and evaluated the design and operational requirements and results of pilot or demonstration testing, and 2) that the equipment provided by the Seller is warranted to produce water in proportion to the design and operational parameters established and demonstrated during pilot testing.

H. The concept of linear scalability relates to the surface area of the membrane and to its corresponding ability to produce water as a dependent variable on an incremental and proportional basis. Dependent variables are the parameters of specific or instantaneous design (e.g., membrane flux, process flows, temperatures, times, maximum pressures, and chemical dosages or consumption) requirements for filtration, backwashing, cleaning, and integrity testing processes that are established on a module basis during piloting and/or incorporated into the unit and system design provided by the Seller to meet the design capacity requirements established in the Contract Documents.

I. The concept of linear scalability excludes the independent variables that involve membrane removal performance and overall system performance established in the Contract Documents. Such independent variables include the water quality removal requirements, removal efficiency, and the minimum design requirements for Maintenance/Recovery Clean interval when the membrane system is operated within its intended process design range.

J. Seller's relationship to the Buyer in performance of this Agreement is that of an Independent Contractor. The personnel performing services under this Agreement shall at all times be under the Seller's exclusive direction and control and not employees of the Buyer. Seller shall pay all wages, salaries and other amounts due to its employees in connection with this agreement and shall be responsible for all applicable state, federal, and local reports and obligations respecting them such as labor wages, social security, income tax withholding, unemployment compensation and similar matters.

## ARTICLE 10 – CONTRACT DOCUMENTS

10.01 CONTENTS

A. The Contract Documents consist of the following:

1. Standard General Conditions for Procurement Contracts [Addendum #3]
2. Procurement Agreement
3. Exhibits to this Agreement (enumerated as follows):
    a. Exhibit A-1 to Agreement between Buyer and Seller dated _____, Assignment of Contract; Consent to Assignment; and Acceptance of Assignment.
    b. Exhibit A-2 to Agreement between Buyer and Seller dated _____ Agreement to Assignment by Seller's Surety.
    c. Seller's completed Proposal Form and Proposal Pricing Form.
    d. Documentation submitted by Seller prior to Notice of Award
4. Performance Bond
5. Payment Bond
6. Section 00 80 50 Supplementary Conditions to EJCD Procurement General Conditions, P-200 (2000 Edition)
7. Conceptual Design Report – Alder Creek Water Treatment Plant Upgrade Project
8. Addenda (Numbers _____to _____, inclusive)
9. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
    a. Notice to Commence Fabrication
    b. Notice of Completed Installation
    c. Notice of Completed Commissioning
    d. Notice of Training Completion
    e. Notice of Substantial Completion
    f. Final Acceptance
    g. Written Amendment(s)
    h. Change Order(s)
    i. Field Order(s)

j. Engineer's Written Interpretation(s).

B. The documents listed in Paragraph 10.01 A. are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 10.

D. The Contract Documents may only be amended or supplemented as provided in Paragraph 3.04 of the General Conditions.

E. In resolving inconsistencies or ambiguities between two or more components of the Contract Documents, the highest precedence shall be given to the Agreement and the order of precedence shall decrease in the following manner:

1. Standard General Conditions for Procurement Contracts [Addendum #3]
2. Agreement
3. Addenda
4. Section 00 80 50 Supplementary Conditions to EJCD Procurement General Conditions, P-200 (2000 Edition)
5. Specification Section 01 74 00, Membrane System and Module Warranty
6. Exhibits to the Agreement
7. Performance Bond
8. Payment Bond.
9. Certificates of Insurance
10. Final Acceptance(s)
11. Change Order(s)
12. Engineer's Written Interpretation(s)
13. Field Order(s)
14. Notice(s) of Substantial Completion
15. Notice(s) of Training Completion
16. Notice(s) of Completed Commissioning
17. Notice(s) of Completed Installation
18. Notice(s) to Commence Fabrication
19. Project Specifications shall be used to govern the quality of the Goods.
20. Submittals provided by the Seller in fulfillment of the Contract.

F. In the event of a conflict between a schedule or a schedule update and a specific requirement of these Contract Documents, the Contract Documents shall, at all times, have precedence. Submittal or acceptance of a schedule or schedule update shall not supersede the requirements of the Contract Documents.

**ARTICLE 11 – MISCELLANEOUS**

11.01 DEFINED TERMS

A. Terms used in this Agreement will have the meanings indicated in the General Conditions and the Supplementary Conditions.

11.02 ASSIGNMENT

A. Buyer has the right to assign the Contract for furnishing Goods and Special Services hereunder and Seller shall accept such assignment. Forms documenting the assignment of the Contract, and consent of Seller's surety to the assignment are attached as exhibits to this Agreement.

1. The Contract will be executed in the name of Buyer initially and may be assigned to a Construction Contractor designated by Buyer. The assignment will occur on the effective date of the agreement between Buyer and the Construction Contractor. As of the date of acceptance of assignment by the Construction Contractor, all references in the Contract Documents to Buyer shall mean the designated Construction Contractor whose responsibilities will include the installation and erection of the Goods.

2. The assignment of the Contract shall relieve Buyer from all further obligations and liabilities under the Contract. After assignment, Seller shall become a subcontractor or Seller to the assignee and, except as noted herein, all rights, duties, and obligations of Buyer under the Contract shall become the rights, duties and obligations of the assignee.

3. After assignment:

a. All performance warranties and guarantees required by the Contract Documents will continue to run for the benefit of Buyer and, in addition, for the benefit of the assignee.

1) Seller shall submit Applications for Payment to the Contractor who shall forward the Application for Payment to the Engineer.

2) Buyer will provide payment directly to the Seller.

b. Except as provided in this Paragraph 11.02.A.3.b., all rights, duties and obligations of Engineer to assignee and Seller under this Contract will cease.

1) Engineer will review Seller's Applications for Payment and make recommendations to assignee for payments as provided in Paragraphs 10.02 and 10.06 of the General Conditions.

2) Upon the written request of either the assignee or Seller, Engineer will issue with reasonable promptness such clarifications or interpretations of the Contract Documents, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications and interpretations will be final and binding on assignee and Seller unless:

a) an appeal from Engineer's clarification or interpretation is made within the time limits and in accordance with the dispute resolution procedures set forth in Article 13 of the General Conditions; or

b) if no such dispute resolution procedures have been set forth, a written notice of intention to appeal is delivered by assignee or Seller to the other within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision (unless otherwise agreed to in writing by assignee and Seller), to exercise such rights or remedies as the appealing party may have with respect to such clarification or interpretation in accordance with applicable Laws and Regulations.

3) When rendering a clarification or interpretation under Paragraph 11.02.A.3.b.2), Engineer will not show partiality to assignee or Seller and will not be liable in connection with any clarification or interpretation rendered in good faith.

c. Upon assignment, Seller shall provide Construction Contractor with revised insurance certificates listing both Construction Contractor and Buyer as additional insureds.

B. No other assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound. Specifically, but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law). Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

11.03 SUCCESSORS AND ASSIGNS

A. Buyer and Seller each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

11.04 CHOICE OF LAW AND VENUE

A. The laws of the State of Oregon shall govern the formation, interpretation, and performance of this Agreement. Venue for mediation and/or actions arising out of this Agreement shall be in Clackamas County, Oregon.

11.05 ENTIRE AGREEMENT

A. This Agreement that includes the Contract Documents contains the entire agreement, between the parties and supersedes all prior negotiations, discussions, obligations, and rights of the parties regarding the subject matter of this Agreement. There is no other written or oral understanding between the parties. No modification, amendment or alteration of this Agreement shall be valid unless it is in writing and signed by the parties hereto.

11.06 COUNTERPARTS

A. This Agreement may be executed in counterparts, which when taken together shall constitute a single signed original as though all parties had executed the same page.

11.07 AUTHORITY TO EXECUTE AGREEMENT

A. Each person signing on behalf of a corporation, partnership, joint venture or governmental entity hereby declares that he or she, or it has the authority to sign on behalf of his or her or its respective corporation, partnership, joint venture, entity and agrees to hold the other party or parties hereto harmless if he or she or it does not have such authority.

11.08 SELLERS TOTAL LIMITATION OF LIABILITY

A. Notwithstanding any other provisions of the Contract Documents, the Seller's total liability for direct damages arising at any time under any of the Contract Documents or otherwise in connection with completing the Contract (whether arising under breach of contract, tort, strict liability, or any other theory of law) shall not exceed the amount of the Contract Price. In no event shall either party be liable for any indirect, penalty, incidental, special, or consequential damages. Seller's aggregate liability under the Contract (whether arising under breach of contract, tort, strict liability, or any other theory of law) shall not exceed the amount of the Contract Price.

BUYER: City of Sandy, Oregon

By: _____

Title _____

Executed on _____/_____, 20____ (month/day/year)

Attest By:

_____

Title _____

Approved As to Form:

_____

_____

SELLER: _____

By: _____

_____

[Corporate Seal]

Attest: _____

Address for giving notice:

_____

_____

Agent for service of process:

_____

_____

_____

(If Seller is a corporation or a partnership, attach evidence of authority to sign.)

**EXHIBIT A-1** to Agreement Between BUYER and SELLER Dated:
_____

ASSIGNMENT OF CONTRACT; CONSENT TO ASSIGNMENT; AND ACCEPTANCE OF ASSIGNMENT

This assignment will be effective on the Effective Date of the Agreement between the Buyer and the construction contractor "Contractor". The Contract between the City of Sandy, Oregon ("Buyer") and _____
("Seller" as "MSS") for furnishing Goods and Special Services under the Contract Documents entitled **Membrane Equipment Procurement – Alder Creek Water Treatment Plant Upgrade Project** is hereby assigned, transferred, and set over to _____, ("Contractor"). Contractor shall be totally responsible for the performance of Seller and for the duties, rights, and obligations of Buyer, not otherwise retained by Buyer, under the terms of the Contract between Buyer and Seller. Upon assignment of this Procurement Agreement, Seller agrees to perform its obligations and duties to Buyer under the supervision and control of and as a subcontractor or Seller to the Contractor.

ASSIGNMENT DIRECTED BY:

City of Sandy, Oregon

_____
(Buyer)

(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement.)

By: _____

Title: _____

Executed on _____/_____ /_____

ASSIGNMENT ACKNOWLEDGED AND ACCEPTED BY:

_____
Seller

(If Seller is a corporation, attach evidence of authority to sign.)

By: _____
(Signature)

_____
(Title)

ASSIGNMENT ACCEPTED BY:

_____
Contractor

(If Construction Contractor is a corporation attach evidence of authority to sign.)

By: _____

**EXHIBIT A-2** to Agreement Between Buyer and Seller
Dated: _____

AGREEMENT TO ASSIGNMENT BY SELLER'S SURETY

Surety hereby acknowledges and agrees that the Contract for furnishing Goods and Special Services under the Contract Documents entitled **Membrane Equipment Procurement – Alder Creek Water Treatment Plant Upgrade Project** by and between the City of Sandy, Oregon ("Buyer") and _____ _____ ("Seller as MSS") may be assigned, transferred, and set over to _____ _____ ("Contractor"), in accordance with Paragraph 11.02 of Agreement between Buyer and Seller.

Surety further agrees that, upon assignment of the Contract, the Contractor shall have all the rights of the Buyer under the Performance Bond.

(Corporate Seal)

Surety Company _____

By: _____
Signature and Title
(Attach Power of Attorney)

END OF SECTION

# SECTION 00 61 00 PERFORMANCE BOND FOR PROCUREMENT CONTRACT
## Document A312™ – 2010
## Conforms with The American Institute of Architects AIA Document 312

Bond Number:

*Performance Bond*

**CONTRACTOR:**
*(Name, legal status, and address)*

**SURETY:**
*(Name, legal status, and principal place of business)*

State of Inc: _____

**OWNER:**
*(Name, legal status, and address)*

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

**CONSTRUCTION CONTRACT**

Date: _____

Amount _____

Description: *(Name and location)*

City of Sandy, OR, Alder Creek Water Treatment Plant Upgrade Project

39250 Pioneer Boulevard, Sandy, OR 97055

**BOND**

Date: _____
*(Not earlier than Construction Contract Date)*

Amount: ☑ ☐

Modifications to this Bond: None See Section 16

**CONTRACTOR AS PRINCIPAL**
Company: *(Corporate Seal)*

**SURETY**
Company: (*Corporate Seal)*

Signature: _____

Name

And Title:

Signature: _____

Name

And Title:

*(Any additional signatures appear on the last page of this Performance Bond)*

*(FOR INFORMATION ONLY – Name, address, and telephone)*

**AGENT or BROKER:**

**OWNER'S REPRESENTATIVE:**
*(Architect, Engineer, or other party)*

§ **1** The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ **2** If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3..

§ **3** If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after.

- **.1** the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- **.2** the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- **.3** the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ **4** Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ **5** When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ **5.1** Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract,

§ **5.2** Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ **5.3** Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ **5.4** Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- **.1** After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- **.2** Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ **6** If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ **7** If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject

to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for:

**.1** the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract
**.2** additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
**.3** liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ **8** If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ **9** The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ **10** The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ **11** Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ **12** Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ **13** When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ **14 Definitions**

**§ 14.1 Balance of the Contract Price**. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made. including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ **14.2 Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ **14.3 Contractor Default**. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ **14.4 Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ **14.5 Contract Documents**. All the documents that comprise the agreement between the Owner and Contractor.

§ **15** If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ **16** Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

| **CONTRACTOR AS PRINCIPAL** | | **SURETY** | |
|---|---|---|---|
| Company: | *(Corporate Seal)* | Company: | *(Corporate Seal)* |
| Signature: _____ | | Signature: _____ | |
| Name and Title: | | Name and Title: | |
| Address | | Address | |

**SECTION 00 61 27 PROPOSAL BOND FORM**

# Document A310™ – 2010
# Conforms with The American Institute of Architects
# AIA Document 310

Bond Number:

*Bid Bond*

**CONTRACTOR:**
*(Name, legal status, and address)*

**SURETY:**
*(Name, legal status, and principal place of business)*

State of Inc: _____

**OWNER:**
*(Name, legal status, and address)*

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

**BOND AMOUNT:**

**PROJECT:**
*(Name, location or address, and Project number, if any)*

City of Sandy, Alder Creek Water Treatment Plant Upgrade Project - 2002006267
City of Sandy, c/o Jenny Coker
39250 Pioneer Blvd., Sandy, OR 97055
(503) 668-6927, Jcoker@ci.sandy.or.us

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null

and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of ,

| | |
|---|---|
| | *(Principal)* *(Seal)* |
| *(Witness)* | |
| | *(Title)* |
| | *(Surety)* *(Seal)* |
| *(Witness)* | |
| | *(Title)* |

**SECTION 00 61 50 PAYMENT BOND FOR PROCUREMENT CONTRACT**

# Document A312™ – 2010
# Conforms with The American Institute of Architects
# AIA Document 312

Bond Number:

*Payment Bond*

**CONTRACTOR:**
*(Name, legal status, and address)*

**SURETY:**
*(Name, legal status, and principal place of business)*

State of Inc: _____

**OWNER*:***
*(Name, legal status, and address)*

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

**CONSTRUCTION CONTRACT**

Date: _____

Amount _____

Description: *(Name and location)*

City of Sandy, OR, Alder Creek Water Treatment Plant Upgrade Project
39250 Pioneer Boulevard, Sandy, OR 97055
(503) 688-6927, Jcoker@ci.sandy.or.us

**BOND**

Date: _____
*(Not earlier than Construction Contract Date)*

Amount:

Modifications to this Bond: ☑ None ☐ See Section 18

| **CONTRACTOR AS PRINCIPAL** | | **SURETY** | |
|---|---|---|---|
| Company: | *(Corporate Seal)* | Company: | (*Corporate Seal)* |
| Signature: | | Signature: | |
| Name | | Name | |
| And Title: | | And Title: | |

*(Any additional signatures appear on the last page of this Payment Bond)*

*(FOR INFORMATION ONLY – Name, address, and telephone)*

| **AGENT or BROKER:** | **OWNER'S REPRESENTATIVE:** *(Architect, Engineer, or other party)* |
|---|---|

§ **1** The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ **2** If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ **3** If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ **4** When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ **5** The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ **5.1** Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ **5.2** Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ **6** If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ **7** When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ **7.1** Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ **7.2** Pay or arrange for payment of any undisputed amounts.

§ **7.3** The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ **8** The Surety’s total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney’s fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ **9** Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this bond, subject to the Owner’s priority to use the funds for the completion of the work.

§ **10** The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ **11** The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ **12** No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ **13** Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ **14** When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ **15** Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ **16 Definitions**

§ **16.1 Claim**. A written statement by the Claimant including at a minimum:

.1 the name of the Claimant;
.2 the name of the person for whom the labor was done, or materials or equipment furnished;
.3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
.4 a brief description of the labor, materials or equipment furnished;
.5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
.6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
.7 the total amount of previous payments received by the Claimant; and
.8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ **16.2 Claimant**. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to Furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of the Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ **16.3 Construction Contract**. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ **16.4 Owner Default**. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms

of the Construction Contract.

§ **16.5 Contract Documents**. All the documents that comprise the agreement between the Owner and Contractor.

§ **17** If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ **18** Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

| **CONTRACTOR AS PRINCIPAL** | | **SURETY** | |
|---|---|---|---|
| Company: | *(Corporate Seal)* | Company: | *(Corporate Seal)* |
| Signature: _____ | | Signature: _____ | |
| Name and Title: | | Name and Title: | |
| Address | | Address | |

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

# STANDARD GENERAL CONDITIONS FOR PROCUREMENT CONTRACTS

*Prepared by*

**ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE**
and

Issued and Published Jointly By

AMERICAN CONSULTING ENGINEERS COUNCIL

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The Associated General Contractors of America

and the

Construction Specifications Institute

EJCDC No. P-700 (2000 Edition)

These Standard General Conditions For Procurement Contracts have been prepared for use with the Suggested Instructions to Bidders For Procurement Contracts (EJCDC No. P-200 2000 Edition), the Suggested Form of Agreement Between Buyer and Seller For Procurement Contracts (EJCDC No. P520, 2000 Edition), and the Guide to Preparation of Supplementary Conditions For Procurement Contracts (EJCDC No. P-800, 2000 Edition). Their provisions are interrelated and a change in one may necessitate a change in the others. Additional information concerning the use of the EJCDC Procurement Documents may be found in the Commentary on Procurement Documents (EJCDC No. P-001).



NOTE:

EJCDC publications may be ordered from any of the three sponsoring organizations above and from CSI headquarters at 99 Canal Center Plaza, Suite 300, Alexandria, VA 22314.

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

*1.01 Defined Terms*

A. Whenever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to the singular or plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Those written or graphic instruments issued prior to the opening of Bids in accordance with the Bidding Requirements which clarify or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument signed by both Buyer and Seller covering the Goods and Special Services and which lists the Contract Documents in existence on the Effective Date of the Agreement.

3. *Application for Payment*--The form acceptable to Buyer which is used by Seller in requesting progress and final payments and which is accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*--An offer or proposal submitted on the prescribed form setting forth the prices for the Goods and Special Services to be provided.

5. *Bidder*--A person who submits a Bid directly to Buyer.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Form of Bid security, if any, and Bid Form with any supplements.

8. *Buyer*--The person or public entity purchasing the Goods and Special Services.

9. *Change Order*--A document recommended by Engineer which is signed by Seller and Buyer and authorizes an addition, deletion, or revision to the Contract Documents or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A written demand or assertion by Buyer or Seller seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract.

11. *Contract*--The entire and integrated written agreement between Buyer and Seller concerning the Goods and Special Services. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--Those items listed in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Files in electronic media format of text, data, graphics, and the like are not Contract Documents, and may not be relied on by Seller. Approved Shop Drawings and other Seller's submittals are not Contract Documents.

13. *Contract Price*-- The moneys payable by Buyer to Seller for furnishing the Goods and Special Services in accordance with the Contract Documents as stated in the Agreement.

14. *Contract Times*--The times stated in the Agreement by which the Goods must be delivered and Special Services must be furnished.

15. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, intent, and character of the Goods and Special Services to be furnished by Seller.

16. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

17. *Engineer*--The person designated as such in the Agreement.

18. *Field Order*--A written order issued by Engineer which requires minor changes in the Goods or Special Services but which does not involve a change in the Contract Price or Contract Times.

19. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

20. *Goods*--The tangible and movable personal property that is described in the Contract Documents, regardless of whether the property is to be later attached to realty.

21. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances,

codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

22. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to the Contract Times.

23. *Notice of Award*--The written notice by Buyer to the apparent Successful Bidder stating that upon timely compliance by the apparent Successful Bidder with the conditions precedent listed therein, Buyer will sign and deliver the Agreement.

24. *Notice to Proceed*-- A written notice given by Buyer to Seller fixing the date on which the Contract Times commence to run and on which Seller shall start to perform under the Contract.

25. *Point of Destination* --The specific address of the location where delivery of the Goods shall be made as stated in the Agreement.

26. *Project*--The total undertaking of which the Goods and Special Services to be provided under the Contract are a part.

27. *Project Manual*--The bound documentary information prepared for bidding and furnishing the Goods and Special Services. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

28. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Goods and which establish the standards by which such portion of the Goods or Special Services will be judged.

29. *Seller*--The person furnishing the Goods and Special Services.

30. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Seller and submitted by Seller to illustrate some portion of the Goods or Special Services.

31. *Special Services*--Services associated with the Goods to be furnished by Seller as required by the Contract Documents.

32. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards and workmanship as applied to the furnishing of the Goods and Special Services, and certain administrative details applicable thereto.

33. *Successful Bidder*--The lowest responsible Bi submitting a responsive Bid, to whom Buyer makes an award.

34. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

35. *Written Amendment*--A written statement modifying the Contract Documents, signed by Buyer and Seller on or after the Effective Date of the Agreement and normally dealing with the administrative aspects of the Contract Documents.

*1.02* Terminology

A. *Intent of Certain Terms or Adjectives*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Goods or Special Services. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Goods or Special Services for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to Engineer any duty or authority to supervise or direct the furnishing of Goods or Special Services or any duty or authority to undertake responsibility contrary to any other provision of the Contract Documents.

2. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

3. The word "non-conforming" when modifying the words "Goods" or "Special Services", refers to Goods or Special Services that fail to conform to the Contract Documents.

4. The word "receipt" when referring to the Goods, shall mean the physical taking and possession by the Buyer under the conditions specified in Paragraph 8.01.B.3.

B. *Day*

1. The word "day" shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

## ARTICLE 2 - PRELIMINARY MATTERS

*2.01 Delivery of Bonds*

A. When Seller delivers the executed Agreements to Buyer, Seller also shall deliver such bonds as Seller may be required to furnish.

*2.02* Copies of Documents

A. Buyer shall furnish Seller up to five copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

*2.03 Commencement* of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

*2.04 Designated* Representatives

A. Buyer and Seller shall each designate its representative at the time the Agreement is signed. Each representative shall have full authority to act on behalf of and make binding decisions in any matter arising out of or relating to the Contract.

*2.05* Before Starting Fabrication/Assembly of Goods

A. *Seller's Review of Contract Documents:* Before commencing performance of the Contract, Seller shall carefully study and compare the Contract Documents and check and verify pertinent requirements therein and, if specified, all applicable field measurements. Seller shall promptly report in writing to Buyer and Engineer any conflict, error, ambiguity or discrepancy which Seller may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any work affected thereby.

*2.06* Progress Schedule

A. Within 15 days after the Contract Times start to run, Seller shall submit to Buyer and Engineer an acceptable progress schedule of activities, including at a minimum, Shop Drawing and Sample submittals, tests, and deliveries as required by the Contract Documents. No progress payment will be made to Seller until an acceptable schedule is submitted to Buyer and Engineer.

B. The progress schedule will be acceptable to Buyer and Engineer if it provides an orderly progression of the submittals, tests, and deliveries to completion within the specified Milestones and the Contract Times. Such acceptance will not impose on Buyer or Engineer responsibility for the progress schedule, for sequencing, scheduling, or progress of the work nor interfere with or relieve Seller from Seller's full responsibility therefor. Such acceptance shall not be deemed to acknowledge the reasonableness and attainability of the schedule.

*2.07 Preliminary* Conference

A. Within 20 days after the Contract Times start to run, a conference attended by Seller, Buyer, Engineer and others as appropriate will be held to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedule referred to in Paragraph 2.06.A., procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

## ARTICLE 3 - CONTRACT DOCUMENTS: INTENT AND AMENDING

*3.01* Intent

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided, whether or not specifically called for, at no additional cost to Buyer.

C. Clarifications and interpretations of, or notifications of minor variations and deviations in, the Contract Documents, will be issued by Engineer as provided in Article 9.

*3.02* Laws and Regulations, Standards, Specifications and Codes

A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws and Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws and Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

B. No provision of any such standard, specification, manual or code, or any instruction of a supplier shall be effective to change the duties or responsibilities of Buyer or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be

effective to assign to Buyer or Engineer, or any of their consultants, agents, or employees any duty or authority to supervise or direct the performance of Seller's obligations or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

*3.03* Reporting and Resolving Discrepancies

A. *Reporting Discrepancies:* If, during the performance of the Contract, Seller discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Contract or of any standard, specification, manual or code, or of any instruction of any supplier, Seller shall promptly report it to Buyer in writing for Engineer's review. Seller shall not proceed with the furnishing of the Goods or Special Services affected thereby until an amendment to or clarification of the Contract Documents has been issued. Seller shall not be liable to Buyer or Engineer for failure to report any such conflict, error, ambiguity, or discrepancy unless Seller knew or reasonably should have known thereof.

B. *Resolving Discrepancies:* Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

1. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

2. the provisions of any Laws or Regulations applicable to the furnishing of the Goods and Special Services (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

*3.04* Amending and Clarifying Contract Documents

A. The Contract Documents may be amended to provide for additions, deletions, and revisions to the Goods or Special Services or to modify the terms and conditions thereof by a Written Amendment or a Change Order.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Goods or Special Services not affecting Contract Price or Contract Times may be authorized, by one or more of the following ways: 1) a Field Order; 2) Engineer's approval of a Shop Drawing pursuant to Paragraph 5.06.D.2; or 3) Engineer's written interpretation or clarification.

## ARTICLE 4 - BONDS AND INSURANCE

*4.01 Bonds*

A. Seller shall furnish performance and payment bonds each in an amount at least equal to the Contract Price, to Buyer. The bonds shall be delivered in accordance with Paragraph 2.01 and shall remain in effect at least one year after the date final payment is due, except as provided otherwise by Laws or Regulations.

B. The bonds shall be issued in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations and shall be executed by a surety named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on a bond is declared bankrupt or becomes insolvent or its right to do business is terminated in the state where the Project is located or it ceases to meet the requirements of Paragraph 4.01.B, Seller shall provide another bond and surety which comply with those requirements within 20 days, at Seller's expense.

*4.02 Insurance*

A. Seller shall provide insurance of the types and coverages and in the amounts stipulated in the Supplementary Conditions.

## ARTICLE 5 - SELLER'S RESPONSIBILITIES

*5.01 Supervision and Superintendence*

A. Seller shall be solely responsible for the means, methods, techniques, sequences, and procedures used in performing its obligations. Seller shall be responsible to see that the completed Goods and Special Services conform to the Contract Documents.

*5.02* Labor, *Materials* and Equipment

A. Seller shall provide competent, qualified and trained personnel in all aspects of its performance of the Contract.

B. All equipment, products and material incorporated into the Goods shall be as specified, or if not specified, shall be new, of good quality and protected, assembled, used, connected, applied, cleaned and conditioned in accordance with the original manufacturer's instructions, except as otherwise may be provided in the Contract Documents.

*5.03* Compliance with Laws and Regulations, Standards, Specifications and Codes

A. Seller shall comply with all Laws and Regulations applicable to the furnishing of the Goods and Special Services.

*5.04* Or *Equals*

A. Whenever an item of material or equipment to be incorporated into the Goods is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier or manufacturer, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item is permitted, other items of material or equipment or material or equipment of other suppliers or manufacturers may be submitted to Buyer for Engineer's review.

1. If in Engineer's sole discretion, such an item of material or equipment proposed by Seller is functionally equal to that named and sufficiently similar so that no change in related work will be required, it may be considered by Engineer as an "or-equal" item.

2. For the purposes of this paragraph, a proposed item of material or equipment may be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment, Engineer determines that: 1) it is at least equal in quality, durability, appearance, strength, and design characteristics; and 2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; and

b. Seller certifies that: 1) there is no increase in any cost including capital, installation or operating to Buyer; and 2) the proposed item will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

B. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraph 5.04.A. Engineer will be the sole judge of acceptability. No "or-equal" will be ordered, manufactured or utilized until Engineer's review is complete, which will be evidenced by an approved Shop Drawing. Engineer will advise Buyer and Seller in writing of any negative determination. Notwithstanding Engineer's approval of an "or-equal" item, Seller shall remain obligated to comply with the requirements of the Contract Documents.

C. *Special Guarantee:* Buyer may require Seller to furnish at Seller's expense a special performance guarantee or other surety with respect to any such proposed "or-equal."

D. *Data:* Seller shall provide all data in support of any such proposed "or-equal" at Seller's expense.

*5.05 Taxes*

A. Seller shall be responsible for all taxes and duties arising out of the sale of the Goods and the furnishing of Special Services. All taxes are included in the Contract Price.

*5.06* Shop Drawings and Samples

A. Seller shall submit Shop Drawings and Samples to Buyer for Engineer's review and approval in accordance with the schedule required in Paragraph 2.06.A. All submittals will be identified as required and furnished in the number of copies specified in the Contract Documents. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Seller proposes to provide.

B. Where a Shop Drawing or Sample is required by the Contract Documents, any related work performed prior to Engineer's approval of the pertinent submittal will be at the sole expense and responsibility of Seller.

C. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, Seller shall have determined and verified:

a. all field measurements (if required), quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto; and

b. that all materials are suitable with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the furnishing of Goods and Special Services.

2. Seller shall also have reviewed and coordinated each Shop Drawing or Sample with the Contract Documents.

3. Each submittal shall include a written certification from Seller that Seller has reviewed the subject submittal and confirmed that it is in compliance with the requirements of the Contract Documents. Both Buyer and Engineer shall be entitled to rely on such certification from Seller.

4. With each submittal, Seller shall give Buyer and Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both in a written communication separate from the submittal and by specific notation on each Shop Drawing or Sample.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples.

2. Engineer's approval of Shop Drawings or Samples will be subject to the standard of Paragraph 1.02.A.1. Engineer's approval will not relieve Seller from responsibility for any variation from the requirements of the Contract Documents unless Seller has in writing called Engineer's attention to each such variation at the time of each submittal as required by Paragraph 5.06.C.1. and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval.

E. Resubmittal Procedures

1. Seller shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. Seller shall direct specific attention in writing to any revisions other than the corrections called for by Engineer on previous submittals.

*5.07 Continuing Performance*

A. Seller shall adhere to the progress schedule established in accordance with Paragraph 2.06.A., and the Goods shall be delivered and the Special Services furnished within the Contract Times specified in the Agreement.

B. Seller shall carry on the work and adhere to the progress schedule during all disputes or disagreements with Buyer. No work shall be delayed or postponed pending resolution of any disputes or disagreements.

*5.08 Seller's Warranties and Guarantees*

A. Seller warrants and guarantees to Buyer that the title to the Goods conveyed shall be proper, its transfer rightful, and free from any security interest, lien, or other encumbrance.

B. Seller warrants and guarantees to Buyer that all Goods and Special Services will conform with the Contract Documents, including any Samples approved by Engineer, and the Goods will be of merchantable quality. Engineer shall be entitled to rely on representation of Seller's warranty and guarantee.

C. Seller's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, improper modification or improper maintenance or operation by persons other than Seller, or

2. normal wear and tear under normal usage.

D. Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Goods or Special Services that are conforming, or a release of Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents:

1. observations by Buyer or Engineer;

2. recommendation by Engineer or payment by Buyer of any progress or final payment;

3. use of the Goods by Buyer;

4. any acceptance by Buyer (subject to the provisions of Paragraph 8.02.D.1) or any failure to do so;

5. the issuance of a notice of acceptance by Buyer pursuant to the provisions of Article 8;

6. any inspection, test or approval by others; or

7. any correction of non-conforming Goods or Special Services by Buyer.

E. Buyer shall within a reasonable time notify Seller of any breach of Seller's warranties or guarantees. If Buyer receives notice of a suit or claim as a result of such breach, Buyer also may give Seller notice in writing to defend such suit or claim. If Seller fails to defend such suit or claim, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit.

*5.09 Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, and their officers, directors, shareholders, partners, employees, agents, consultants, contractors and subcontractors from any and all claims, costs, losses, and demands or judgments for damages for claims (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or relating to a negligent act or omission or the breach of any obligation under this Contract by Seller, or its officers, directors, shareholders, partners, employees, agents, consultants, contractors or subcontractors, or anyone for whom Seller is responsible, provided that any such claim, cost, loss, or damage;

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Goods or Special Services themselves), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of Seller or any individual or entity directly or indirectly employed to furnish any of the Goods or Special Services or anyone for whose acts Seller may be liable, regardless of whether or not caused in part by any

negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. The indemnification obligations of Seller under paragraph 5.09.A shall not extend to the liability of Engineer and Engineer's consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

## ARTICLE 6 - SHIPPING AND DELIVERY

*6.01 Shipping*

A. Seller shall select the carrier and bear all costs of packaging, transportation, insurance, special handling and any other costs associated with shipment and delivery.

*6.02 Delivery*

A. Seller shall deliver the Goods F.O.B. the Point of Destination in accordance with the Contract Times set forth in the Agreement, or other date agreed to by Buyer and Seller.

B. Seller shall provide written notice to Buyer at least 15 days before shipment of the manner of shipment and the anticipated delivery date. The notice shall also include any instructions concerning special equipment or services required at the Point of Destination to unload and care for the Goods. Seller shall also require the carrier to give Buyer at least 24 hours notice by telephone prior to the anticipated hour of delivery.

C. Buyer will be responsible and bear all costs for unloading the Goods from carrier.

D. Buyer will assure that adequate facilities are available to receive delivery of the Goods during the Contract Times set forth in the Agreement, or another date agreed by Buyer and Seller.

E. No partial deliveries shall be allowed, unless permitted or required by the Contract Documents or agreed to in writing by Buyer.

*6.03 Risk of Loss*

A. Risk of loss and insurable interests transfer from Seller to Buyer upon Buyer's receipt of the Goods.

B. Notwithstanding the provisions of Paragraph 6.0 if Buyer rejects the Goods as non-conforming, the risk of loss on such Goods shall remain with Seller until Seller corrects the non-conformity or Buyer accepts the Goods.

## ARTICLE 7 - CHANGES: SCHEDULE AND DELAY

*7.01 Changes in the Goods and Special Services*

A. Buyer may at any time, without notice to any surety, make changes in the Contract Documents within the general scope of the Contract.

B. If any such change or action by Buyer affects the Contract Price or Contract Times, Seller shall notify Buyer within 15 days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to Buyer within 45 days after such occurrence. If Seller fails to do so, Seller waives any Claim for such adjustment.

C. Seller shall not suspend performance while Buyer and Seller are in the process of making such changes and any related adjustments.

*7.02 Changes in Laws and Regulations*

A. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of furnishing the Goods and Special Services shall be the subject of an adjustment in Contract Price or Contract Times. If Buyer and Seller are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 9.06.A.

Clarification/exception: proposed milestone payments

*7.03* Changing *Contract* Price or Contract Times

A. The Contract Price or Contract Times may only be changed by:

1. a Change Order;

2. a Written Amendment; or

3. a written unilateral order of Buyer, in which case Seller shall be entitled to an equitable adjustment in Contract Price or Contract Times for any reasonable and necessary costs or delays incurred by Seller to accommodate such a change.

B. If Seller is prevented from delivering the Goods or performing the Special Services within the Contract Times for any unforeseen reason beyond its control and not attributable to its actions or inactions, then Seller shall be entitled to an adjustment of the Contract Times to the extent attributable to such reason. Such reasons include fire, floods, epidemics, abnormal weather conditions, acts of God, acts of war, directions by government authority, and other like matters. If such an event occurs and delays

Seller's performance, Seller shall notify Buyer in writing within 15 days of the beginning of the event causing the delay, stating the reason therefor.

C. Contract Times will not be modified for delays within the control of Seller, including labor strife, transportation shortages or delays at Seller's facilities. Delays attributable to and within the control of Seller's subcontractors or suppliers shall be deemed to be delays within the control of Seller.

D. If Seller is prevented from delivering the Goods or furnishing the Special Services within the Contract Times due to the actions or inactions of Buyer, Seller shall be entitled to any reasonable and necessary additional costs arising out of such delay to the extent directly attributable to Buyer.

E. Neither Buyer nor Seller shall be entitled to any damages arising from delays which are beyond the control of both Buyer and Seller, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, acts of war, direction by government authority, and other like matters.

## ARTICLE 8 - BUYER'S RIGHTS

*8.01 Inspections and Testing*

A. General

1. Buyer shall have the right to perform, or cause to be performed, reasonable inspections and require reasonable tests of the Goods at Seller's facility, and at the Point of Destination. Seller shall allow Buyer a reasonable time to perform such inspections or tests.

2. Seller shall bear all expenses, except for travel, lodging and subsistence expenses of Buyer's representatives, for inspections and tests at Seller's facility, but Buyer shall be entitled to reimbursement from Seller of travel, lodging and subsistence expenses of Buyer's representatives if the Goods are non-conforming.

3. Buyer shall bear all expenses, except for travel, lodging and subsistence expenses of Seller's representatives, for inspections and tests at the Point of Destination, but Buyer shall be entitled to reimbursement from Seller for Buyer's expenses for reinspection or retesting if, on the basis of an initial inspection or testing, the Goods are determined to be non-conforming.

4. Seller shall provide Buyer 30 days written notice of the readiness of the Goods for all inspections, tests, or approvals which the Contract Documents specify are to be observed by Buyer prior to shipment.

5. Buyer will give Seller timely notice of all specified tests, inspections and approvals of the Goods which are to be conducted at the Point of Destination.

6. If, on the basis of any inspections or testing, the Goods appear to be conforming, Buyer will give Seller prompt notice thereof. If on the basis of said inspections or testing, the Goods appear to be non-conforming, Buyer will give Seller prompt notice thereof and will advise Seller of the remedy Buyer elects under the provisions of Paragraph 8.02.

7. Neither payments made by Buyer to Seller prior to any tests or inspections, nor any tests or inspections shall constitute acceptance of non-conforming Goods, or prejudice Buyer's rights under the Contract.

B. Inspection on Delivery

1. Buyer or Engineer will inspect the Goods upon delivery solely for purposes of identifying the Goods and general verification of quantities and observation of apparent condition in order to provide a basis for a progress payment. Such inspection will not be construed as final or as receipt of any Goods and Special Services that, as a result of subsequent inspections and tests, are determined to be non-conforming.

2. Within ten days of such inspection, Buyer shall provide Seller with written notice of Buyer's determination regarding conformity of the Goods. In the event Buyer does not provide such notice, it will be presumed that the Goods appear to be conforming.

3. If, on the basis of the inspection specified in Paragraph 8.01.B.1, the Goods appear to be conforming, Buyer's notice thereof to Seller will acknowledge receipt of the Goods.

C. Final Inspection

1. After all of the Goods have been incorporated into the Project, tested in accordance with such testing requirements as are specified, and are functioning as intended, Buyer or Engineer will make a final inspection.

2. If, on the basis of the final inspection, the Goods are conforming, Buyer's notice thereof will constitute Buyer's acceptance of the Goods.

3. If, on the basis of the final inspection, the Goods are non-conforming, Buyer will identify the non-conformity in writing.

*8.02 Non-Conforming Goods or Special Services*

A. If, on the basis of inspections and testing prior to delivery, the Goods appear to be non-conforming, or if at any time after Buyer has acknowledged receipt of delivery and before the expiration of the correction period described in Paragraph 8.03, Buyer determines that the Goods are non-conforming, Seller shall promptly, without cost to Buyer and in response to written instructions from Buyer, either

correct such non-conforming Goods, or, if rejected by Buyer, remove and replace the non-conforming Goods with conforming Goods, including all work required for reinstallation.

B. Buyer's Rejection of Non-Conforming Goods

1. If Buyer elects to reject the Goods in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Goods. If Goods have been delivered to Buyer, Seller shall promptly, and within the Contract Times, remove and replace the rejected Goods.

2. Seller shall bear all costs, losses and damages attributable to the removal and replacement of the non-conforming Goods as provided in Paragraph 8.02.E.

3. Upon rejection of the Goods, Buyer retains a security interest in the Goods or to the extent of any payments made and expenses incurred in their testing and inspection.

C. Remedying Non-Conforming Goods or Special Services

1. If Buyer elects to permit the Seller to modify the Goods to remove the non-conformance, Seller shall promptly provide a schedule for such modifications and shall make the Goods conforming within a reasonable time.

2. If Buyer notifies Seller in writing that any of the Special Services are non-conforming, Seller shall promptly provide conforming services acceptable to Buyer. If Seller fails to do so, Buyer may delete the Special Services and reduce the Contract Price a commensurate amount.

D. Buyer's Acceptance of Non-Conforming Goods

1. Instead of requiring correction or removal and replacement of non-conforming Goods discovered either before or after final payment, Buyer may accept the non-conforming Goods. Seller shall bear all costs, losses, and damages attributable to Buyer's evaluation of and determination to accept such non-conforming Goods as provided in Paragraph 8.02.E.

E. Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, retesting and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods or Special Services, including the correction or removal and replacement of the non-conforming Goods and the replacement of property of Buyer and others destroyed by the correction or removal and replacement of the non-conforming Goods, or the obtaining of conforming Special Services from others.

*8.03 Correction Period*

A. Seller's responsibility for correcting all non-conformities in the Goods will extend for a period of one year after the earlier of the date on which Buyer has placed the Goods in continuous service or the date of final payment, or for such longer period of time as may be prescribed by Laws or Regulations or by the terms of any specific provisions of the Contract Documents.

## ARTICLE 9 - ROLE OF ENGINEER

*9.01 Duties and Responsibilities*

A. The duties and responsibilities and the limitations of authority of Engineer are set forth in the Contract Documents.

*9.02 Clarifications and* Interpretations

A. Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents as Engineer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications and interpretations will be binding on Buyer and Seller. If either Buyer or Seller believes that a written clarification or interpretation justifies an adjustment in the Contract Price or Contract Times, either may make a Claim therefor.

*9.03 Authorized Variations*

A. Engineer may authorize minor deviations or variations in the Contract Documents by: 1) issuance of approved Shop Drawings when such change or deviation was duly noted by Seller as required in Paragraph 5.06.C.4, or 2) a Field Order.

*9.04 Rejecting Non-Conforming Goods and Special Services*

A. Engineer will have the authority to disapprove or reject Goods or Special Services which Engineer believes to be non-conforming.

*9.05 Decisions* on Requirements of Contract Documents

A. Engineer will be the initial interpreter of the Contract Documents and judge of the acceptability of the Goods and Special Services. Claims, disputes and other matters relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to Seller's performance will be referred initially to Engineer in writing with a request for a formal decision in accordance with this paragraph.

B. When functioning as interpreter and judge under this Paragraph 9.05, Engineer will not show partiality to Buyer

or Seller and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by Engineer pursuant to this Paragraph 9.05 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in Paragraph 10.07) will be a condition precedent to any exercise by Buyer or Seller of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

*9.06 Claims* and Disputes

A. *Notice*: Written notice of each Claim, dispute or other matter relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to Seller's performance shall be delivered by the claimant to Engineer and the other party to the Agreement within 15 days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to Engineer and the other party within 45 days after such occurrence unless Engineer allows an additional period of time to ascertain more accurate data.

B. *Engineer's Decision*: Engineer will render a decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. Engineer's written decision on such Claim, or dispute, or other matter will be final and binding upon Buyer and Seller unless:

1. an appeal from Engineer's decision is made within the time limits and in accordance with the dispute resolution procedures set forth in Article 13; or

2. if no such dispute resolution procedures have been set forth, a written notice of intention to appeal is delivered by Buyer or Seller to the other and to Engineer within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision (unless otherwise agreed to in writing by Buyer and Seller), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If Engineer does not render a formal decision in writing within the time stated in Paragraph 9.06.B., a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

## ARTICLE 10 - PAYMENT

*10.01 Applications for Progress Payments*

A. Seller shall submit to Buyer for Engineer's review Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Contract Documents and also as Buyer or Engineer may reasonably require. The timing and amounts of progress payments shall be as stipulated in the Agreement.

1. The first application for Payment will be submitted after review and approval by Engineer of all Shop Drawings and of all Samples required by the Contract Documents.

2. The second Application for Payment will be submitted after receipt of the Goods has been acknowledged in accordance with Paragraph 8.01.B and will be accompanied by a bill of sale, invoice or other documentation satisfactory to Buyer warranting that Buyer has rightfully received good title to the Goods from Seller and that the Goods are free and clear of all liens. Such documentation will include releases and waivers from all parties with viable lien rights. In the case of multiple deliveries of Goods, additional Applications for Payment accompanied by the required documentation will be submitted as Buyer acknowledges receipt of additional items of the Goods.

*10.02 Review of Applications for Progress Payments*

A. Engineer will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Buyer, or return the Application to Seller indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Seller may make the necessary corrections and resubmit the Application.

1. Engineer's recommendation of payment requested in the first Application for Payment will constitute a representation by Engineer, based on Engineer's review of the Application for Payment and the accompanying data, that the Shop Drawings and Samples have been reviewed and approved as required by the Contract Documents and Seller is entitled to payment of the amount recommended.

2. Engineer's recommendation of payment requested in the Application for Payment submitted upon Buyer's acknowledgment of receipt of the Goods will constitute a representation by Engineer, based on Engineer's review of the Application for Payment and the accompanying data Seller is entitled to payment of the amount recommended. Such recommendation will not constitute a representation that Engineer has made a final inspection of the Goods, that the Goods are free from non-conformities, acceptable or in conformance with the Contract Documents, that Engineer has made any investigation as to Buyer's title to the Goods, that exhaustive or continuous inspections have been made to check the quality or the quantity of the Goods beyond the responsibilities specifically assigned to Engineer in the Contract Documents or that there may not

be other matters or issues between the parties that might entitle Seller to additional payments by Buyer or Buyer to withhold payment to Seller.

3. Engineer may refuse to recommend that all or any part of a progress payment be made, or Engineer may nullify all or any part of any payment previously recommended if, in Engineer's opinion, such recommendation would be incorrect or if on the basis of subsequently discovered evidence or subsequent inspections or tests Engineer considers such refusal or nullification necessary to protect Buyer from loss because the Contract Price has been reduced, Goods are found to be non-conforming, or Seller has failed to furnish acceptable Special Services.

*10.03 Amount and Timing of Progress Payments*

A. Subject to Paragraph 10.02.A., the amounts of the progress payments will be as provided in the Agreement. Buyer shall within 30 days after receipt of each Application for Payment with Engineer's recommendation pay Seller the amount recommended; but, in the case of the Application for Payment upon Buyer's acknowledgment of receipt of the Goods, said 30-day period may be extended for so long as is necessary (but in no event more than 60 days) for Buyer to examine the bill of sale and other documentation submitted therewith. Buyer shall notify Seller promptly of any deficiency in the documentation and shall not unreasonably withhold payment.

*10.04 Suspension of or Reduction in Payment*

A. Buyer may suspend or reduce the amount of progress payments, even though recommended for payment by Engineer, under the following circumstances:

1. Buyer has reasonable grounds to conclude that Seller will not furnish the Goods or the Special Services in accordance with the Contract Documents,

2. Buyer has requested in writing assurances from Seller that the Goods or Special Services will be delivered or furnished in accordance with the Contract Documents, and Seller has failed to provide adequate assurances within ten days of Buyer’s written request.

B. If Buyer refuses to make payment of the full amount recommended by Engineer, Buyer will provide Seller and Engineer immediate written notice stating the reason for such action and promptly pay Seller any amount remaining after deduction of the amount withheld. Buyer shall promptly pay Seller the amount withheld when Seller corrects the reason for such action to Buyer’s satisfaction.

*10.05 Final Application for Payment*

A. After Seller has corrected all non-conformities to the satisfaction of Buyer and Engineer, furnished all Special Services, and delivered all documents required by the Contract Documents, Engineer will issue to Buyer and Seller a notice of acceptability. Seller may then make application for final payment following the procedure for progress payments. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents, a list of all unsettled claims and such other data and information as Buyer or Engineer may reasonably require.

*10.06 Final Payment*

A. If, on the basis of the review of the final Application for Payment and accompanying documentation, Engineer is satisfied that the Goods and Special Services have been furnished in accordance with the Contract Documents, and that Seller's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, recommend in writing final payment subject to the provisions of Paragraph 10.07 and present the Application to Buyer. Otherwise, Engineer will return the Application to Seller, indicating the reasons for refusing to recommend final payment, in which case Seller shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, Buyer shall, within 30 days after receipt thereof, pay Seller the amount recommended by Engineer.

*10.07 Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Buyer against Seller, except Claims arising from unsettled liens and Claims, from non-conformities in the Goods or Special Services appearing after final payment, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Seller's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Seller against Buyer other than those previously made in accordance with the requirements herein and expressly noted in writing by Seller as still unsettled in its final Application for Payment.

## ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION

*11.01 Cancellation*

A. Buyer has the right to cancel the Contract, without cause, at any time prior to delivery of the Goods by written notice. Cancellation pursuant to the terms of this paragraph shall not constitute a breach of contract by Buyer. Upon cancellation:

1. Buyer shall pay Seller for Goods, specially manufactured for the Project, plus any documented

reasonable direct and indirect costs incurred by Seller in producing such Goods not recovered by payment for the reasonable value of the Goods.

2. For Goods which are not specially manufactured for the Project, Seller shall be entitled to a restocking charge of 10 percent of the unpaid Contract Price of such Goods.

*11.02 Suspension of Performance by Buyer*

A. Buyer has the right to suspend performance of the Contract, without cause, by written notice. Upon suspension under this paragraph, Seller shall be entitled to an increase in the Contract Times and Contract Price caused by the suspension, provided that performance would not have been suspended or delayed for causes attributable to Seller.

Clarification/exception: Add to end of paragraph "If the project is terminated for convenience or is suspended for more than 90 days, (by no fault of seller), seller shall be entitled to payment of all the costs and expenses incurred for work properly performed upon the date of termination or prolonged suspension, including the attributable portion of overhead already included in the contract price."

*11.03 Suspension of Performance by Seller*

A. Subject to the provisions of Paragraph 5.07.B, Seller may suspend the furnishing of the Goods and Special Services only under the following circumstance:

1. Seller has reasonable grounds to conclude that Buyer will not perform its future payment obligations under the Contract. ("Reasonable grounds" shall not include a pending dispute or disagreement with Buyer) and,

2. Seller has requested in writing assurances from Buyer that future payments will be made in accordance with the Contract, and Buyer has failed to provide such assurances within ten days of Seller's written request.

*11.04 Breach and Termination*

A. Buyer's Breach

1. Buyer shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including but not limited to:

a. wrongful rejection or revocation of Buyer's acceptance of the Goods,

b. failure to make payments in accordance with the Contract Documents, or

c. wrongful repudiation of the Contract.

2. Seller shall have the right to terminate the Contract for cause by declaring a breach should Buyer fail to comply with any material provisions of the Contract. Upon termination, Seller shall be entitled to all remedies provided by Laws and Regulations.

a. In the event Seller believes Buyer is in breach of its obligations under the Contract, Seller shall provide Buyer with reasonably prompt written n setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Buyer shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Seller may grant in writing) within which to cure the alleged breach.

B. Seller's Breach

1. Seller shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including, but not limited to:

a. failure to deliver the Goods or perform the Special Services in accordance with the Contract Documents,

b. wrongful repudiation of the Contract, or

c. delivery or furnishing of non-conforming Goods or Special Services.

2. Buyer may terminate Seller's right to perform the Contract for cause by declaring a breach should Seller fail to comply with any material provision of the Contract Documents. Upon termination, Buyer shall be entitled to all remedies provided by Laws and Regulations.

a. In the event Buyer believes Seller is in breach of its obligations under the Contract, and except as provided in Paragraph 11.04.B.2.b, Buyer shall provide Seller with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Seller shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure the alleged breach.

b. If and to the extent that Seller has provided a performance bond under the provisions of Paragraph 4.01, the notice and cure procedures of that bond, if any, shall supersede the notice and cure procedures of Paragraph 11.04.B.2.a.

## ARTICLE 12 - LICENSES AND FEES

*12.01 Intellectual Property and License Fees*

A. Unless specifically stated elsewhere in the Contract Documents, Seller is not transferring any intellectual property rights, patent rights, or licenses for the Goods delivered. However, in the event the Seller is manufacturing to Buyer's design, Buyer retains all intellectual property rights in such design.

B. Seller shall pay all license fees and royalties and assume all costs incident to the use or the furnishing of the

Goods, unless specified otherwise by the Contract Documents.

*12.02 Seller's Infringement*

A. Subject to Paragraph 12.01.A, Seller shall indemnify and hold harmless Buyer, Engineer and their officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement or alleged infringement of any United States or foreign patent or copyright by any of the Goods delivered hereunder.

B. In the event of suit or threat of suit for intellectual property infringement, Buyer will notify Seller within a reasonable time of receiving notice thereof.

C. Upon written demand from Buyer, Seller shall be given the opportunity to defend the claim or suit, including negotiating a settlement. Seller shall have control over such claim or suit, provided that Seller agrees to bear all expenses and to satisfy any adverse judgment thereof.

1. If Seller fails to defend such suit or claim after written demand by Buyer, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit or claim.

2. If Buyer fails to provide Seller the opportunity to defend such suit or claim after written demand by Seller, Buyer shall be barred from any remedy against Seller for such suit or claim.

D. If a determination is made that Seller has infringed upon intellectual property rights of another, Seller may obtain the necessary licenses for Buyer's benefit, or replace the Goods and provide related design and construction as necessary to avoid the infringement at Seller's own expense.

*12.03 Buyer's Infringement*

A. Buyer shall indemnify and hold harmless Seller, and its officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement or alleged infringement of any United States or foreign patent or copyright caused by Seller's compliance with Buyer's design of the Goods or Buyer's use of the Goods in combination with other materials or equipment in any process (unless intent of such use was known to Seller and Seller had reason to know such infringement would result).

B. In the event of suit or threat of suit for intellectual property infringement, Seller must within a reasonable time after receiving notice thereof notify Buyer.

C. Upon written demand from Seller, Buyer shall be given the opportunity to defend the claim or suit, including negotiating a settlement. Buyer shall have control over such claim or suit, provided that Buyer agrees to bear all expenses and to satisfy any adverse judgment thereof.

1. If Buyer fails to defend such suit or claim after written demand by Seller, Buyer will be bound in any subsequent suit or claim against Buyer by Seller by any factual determination in the prior suit or claim.

2. If Seller fails to provide Buyer the opportunity to defend such suit or claim after written demand by Buyer, Seller shall be barred from any remedy against Buyer for such suit or claim.

*12.04 Reuse of Documents*

A. Neither Seller nor any other person furnishing any of the Goods or Special Services under a direct or indirect contract with Seller shall: (1) acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions; or (2) reuse any of such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Buyer and Engineer and specific written verification or adaptation by Engineer. This prohibition will survive termination or completion of the Contract. Nothing herein shall preclude Seller from retaining copies of the Contract Documents for record purposes.

## ARTICLE 13 - DISPUTE RESOLUTION

*13.01 Dispute Resolution Method*

A. Disputes between Buyer and Seller will be resolved as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of Paragraphs 9.05 and 9.06, Buyer and Seller may exercise such rights or remedies as they have under Controlling Law.

## ARTICLE 14 - MISCELLANEOUS

*14.01 Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

*14.02 Controlling Law*

A. This Contract is to be governed by the law of the state in which the Point of Destination is located.

*14.03 Computation* of Time

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

*14.04* Cumulative *Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

*14.05 Survival of Obligations*

A. All representations, indemnifications, warranties and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Goods or Special Services and termination or completion of the Agreement.

# SECTION 00 80 50 SUPPLEMENTARY CONDITIONS TO EJCDC PROCUREMENT GENERAL CONDITIONS, P-700 (2000 EDITION)

These Supplementary Conditions amend or supplement the Standard General Conditions for Procurement Contracts No. P-700 (2019 Edition) and other provisions of the Procurement Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

## ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

**Modify Article 1.01A.4 to read:**

4. *Bid*--See Proposal

**Modify Article 1.01A.5 to read:**

5. *Bidder*--See Proposer

**Modify Article 1.01A.29 to read:**

29. *Seller*--The person, firm, or corporation with whom Buyer has entered into the Procurement Agreement to furnish Goods and Special Services.

**Add new articles at the end of Article 1.01:**

"36. *Substantial Completion*--The time at which the Work progresses to the point where, in the opinion of Engineer, the Work is sufficiently complete, in accordance with the Contract Documents, so that the Work can be safely and conveniently utilized for the purpose for which it is intended.
The Work will be considered Substantially Complete after successful completion of the demonstration period.

37. *Construction Contractor*-- The person, firm or corporation with whom the Buyer will enter into a Contract for the general construction of and the installation of the Seller's equipment."

38. *Backwash*--The periodic reversal of flow through a filter which may be accompanied by water in conjunction with air or oxidants at a low concentration (less than 10 mg/L of total chlorine) generally associated with the intermittent waste stream from an ultrafiltration or microfiltration membrane system used to remove particulate matter.

39. *Calendar Day*--See Day

40. *Chemical Washing*--The periodic application of a concentrated chemical solution at high concentration (i.e. more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10 or a surfactant or enzymatic cleaning agent) to a membrane for a short duration of time (twice per day maximum for a total duration of less than 60 minutes) for the intended purpose of maintaining membrane permeability or reducing membrane fouling by a factor of less than 33 percent of the total amount of fouling that may be observed by the membrane

41. *Buyer*—City of Sandy.

42. *Clean In Place*--The periodic application of a concentrated chemical solution at high concentration (i.e., more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10, or a surfactant or enzymatic cleaning agent) a membrane for an extended duration of time (more than 60 minutes per day) for the intended purpose of reducing membrane fouling by a factor of more than 33 percent of the total amount of fouling that may be observed by the membrane.

43. *Contractor*--See Construction Contractor.

44. *Contract Year*--A period of 365 calendar days or 366 days every 4th year beginning with year 2000.

45. *Component Equipment*--describes any item of equipment that is designed and fabricated or manufactured by others but incorporated by and supplied by the Seller in fulfillment of the Contract.

46. *Defective*--See Non-Conforming

47. *Drawing Clarification / Plan Clarification*--An answer from the Buyer or Engineer, in response to an inquiry from the Seller, intended to make the requirement(s) of the drawings or plans clearly understood. Drawing clarifications or plan clarifications may be sketches, drawings or in narrative form and will not change any requirements of the drawings or plans. Responses to the Seller's inquiries shall be as outlined in Section 9.2 of these Procurement General Conditions.

48. *Final Acceptance*--Refers to such time as the Seller has fulfilled all its obligations, other than warranties and guarantees, under the Contract Documents.

49. *MF*--Membrane Filtration.

50. *MSS*—Membrane System Supplier, see Seller.

51. *Module*--A grouping of hollow fiber membranes that are secured into a common potting compound.

52. *Notice of Acceptability*--The written notice issued by the Engineer that the Seller has furnished all Goods and Special Services, and delivered all maintenance and operating instructions, schedules, guarantees, certificates of inspection, and other documents as required by the Contract Documents.

53. *Notice to Commence Fabrication*--A written notice given by Buyer to Seller fixing the date(s) on which the Contract Times for the production and delivery of Goods commence to run and on which Seller shall start to perform under the applicable portion of the Contract.

54. *Notice of Completed Commissioning*--The written notice issued by the Engineer indicating that the Seller has completed the commissioning of the membrane system. The notice shall indicate that the Engineer has reviewed the status of membrane system commissioning to its satisfaction, identified items to be corrected, and that those items that require correction by the Seller have been successfully completed as to allow training of the Buyer's Operational and Maintenance Personnel to commence.

55. *Notice of Completed Installation*--The written notice issued by the Engineer that the Seller has reviewed the installation of the Goods and identified all item to be corrected ant that those items that require correction by the Contractor have been completed as to allow Commissioning of the membrane system to commence.

56. *Notice of Completed Training*--The written notice issued by the Engineer that the Seller has completed training of the Buyer's as a prerequisite to Acceptance Testing of the membrane system.

57. *Notice of Substantial Completion*--The written notice issued by the Engineer to the Seller that Acceptance Testing has been successfully completed.

58. *Phase*--Separate portions of the Project, each of which is subject to Buyer

obtaining funds before Seller is authorized to proceed.

59. *Proposer*--Any person, firm, or corporation submitting a Proposal for providing the Goods and Special Services.

60. *Proposal*--The offer or proposal of the Proposer submitted on the prescribed form setting forth the price(s) for furnishing the Goods and Special Services:

61. *Proposal Documents*--Request for Proposals or advertisement, if any, Procurement Instructions to Proposers, other Proposal information and requirements, Proposal forms and attachments, contract and Bond forms, and the proposed Contract Documents, including any Addenda issued prior to receipt of Proposals.

62. *Proposers Equipment*--describes equipment that has been designed by, manufactured by or fabricated specifically for and supplied by the Seller in fulfillment of the contract.

63. *Special Engineering Services*--The preparation and delivery of shop drawings and other submittals required by the Buyer.

64. *Submittal*--Any documentation specifically prepared by or for the Seller and provided to the Buyer to illustrate fulfill with the requirements of the Contract. Examples of submittals include but are not limited to Applications for Payment, Bonds, Change Orders, Certificates, Manuals, Samples, Shop Drawings, and Schedules.

65. *Successful Proposer*--The Proposer Submitting a responsive Proposal to whom the Buyer makes an award.

66. *System*--Hollow fiber membrane filtration system equipment. The System is comprised Units and ancillary equipment.

67. *Unit(s)*-- A Unit is an assembly of equipment that includes piping, valves, instrumentation, controls, ancillary equipment, appurtenances, support systems, and filtration modules required to treat the raw water.

68. *Train*--A grouping of membrane filtration units that share common ancillary equipment.

69. *Work*--A general description for providing Goods and Special Services as required by the Contract Documents.

70. *Working Days*--is used to describe traditionally accepted business workdays of Monday through Friday inclusive, exclusive of any official organizational or official government holidays for the applicable organization."

**ARTICLE 2 - PRELIMINARY MATTERS**

**Add the following to Article 2.01:**

"B. The Seller shall deliver the required Bonds and Insurance certificates in accordance with Article 4 of the General Conditions.

1. At the time of the effective date of the Agreement, a Performance Bond shall be provided for the Special Engineering Services and Pilot Testing for the amount of $175,000 dollars.

2. Another Performance Bond and a Payment Bond for the remaining portion of the Contract Price shall be provided upon issuance of the "Notice to Commence Fabrication." The Performance Bond shall provide coverage for the performance of the Seller under this Contract until expiration and exclude any continuing obligations of the Seller under this control until expiration and

exclude any continuing obligations of the Suppler, including, but not limited to, the Seller's Membrane System Equipment and Module and Warranty, or other warranties that survive the completion of the Contract."

**Delete Article 2.03 in its entirety and replace with the following:**

"2.03 Commencement of Contract Times

A. The Contract Times will commence to run on the Effective Date of the Agreement."

**Delete Article 2.07 in its entirety and replace with the following:**

"2.07 Within 14 days after the Contract Times start to run, a conference attended by Seller, Buyer, Engineer and others as appropriate will be held in Sandy, OR to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedule referred to in Article 5 of Section 500, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records."

**ARTICLE 3 - CONTRACT DOCUMENTS: INTENT AND AMENDING**

**Add three new articles at the end of Article 3.02:**

"C. The Specifications may vary in form, format and style. Some specification sections are written in varying degrees of streamlined or declarative style and some sections may be relatively narrative by comparison. Omissions of such words and phrases as "the Seller shall," "in conformity with," "as shown," or "as specified" are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the section. The Seller shall not take advantage of any variation of form, format or style in making claims for extra Work.

D The cross referencing of specification sections under the subarticle heading "Related Sections include but are not necessarily limited to:" and elsewhere within each specification section is provided as an aid and convenience to the Seller. The Seller shall not rely on the cross referencing provided as a complete listing of all specifications sections that may impact the Work of a particular specification section. The Seller shall be responsible to coordinate the entire work under the Procurement Documents and provide a complete Project whether or not the cross referencing is provided in each section or whether or not the cross referencing is complete or correct.

E It is the intent of the Procurement Documents that the equipment be compatible and coordinated to produce a fully integrated and operational system. It is the responsibility of the Seller furnishing any one item of equipment, or all equipment included in the Procurement Documents, to assure complete compatibility and coordination of the equipment they are furnishing.

F OSHA Requirements – All work under this Contract shall be performed in accordance with all applicable safety codes, ordinances and other regulations. Particular emphasis shall be given to the applicable regulations of the State of Oregon promulgated pursuant thereto. For purposes of this Contract neither the Buyer, nor the Engineer, nor their respective officers, employees, consultants and inspectors are to be considered experts in safety, and all safety will be the responsibility of the Seller. The Seller shall review its work for compliance with applicable safety requirements and notify the Buyer and the Engineer if there are specific requirements of the Goods that require modifications to the plans and specifications to address safety considerations of the Seller's Goods. This responsibility shall include public safety as well as workers' safety.

G Seller shall comply with the applicable State of Oregon Administrative Rules."

**Add Article 3.04B.1 as follows:**

"1. RFI form attached to this section is the proper instrument to be used for Engineer's written interpretations or clarifications to the contract documents."

**ARTICLE 4 - BONDS AND INSURANCE**

**Delete Article 4.01A in its entirety and replace with the following:**

*"4.01 Bonds*

A. Seller shall furnish performance and payment bonds, each in an amount equal to the Contract Price, to Buyer. The bonds shall be delivered in accordance with Article 2.1 and shall remain in effect one year after the date final payment is due to Construction Contractor, except as provided otherwise by Laws or Regulations."

**Delete Article 4.02 in its entirety and replace with the following:**

*"4.02 Insurance*

A. Seller shall provide insurance of the types and coverages and in the amounts stipulated in the Section 00 83 17, Insurance Specifications for Seller. Seller shall, for the protection and benefit of the Buyer, procure, pay for and maintain in full force and effect, at all times during the performance of the on-site portion of the Work until final payment of the Work or for such duration as required, policies of insurance set forth in this Article, in form and substance acceptable to Buyer. Seller hereby agrees to deliver to Buyer, at least ten (10) days prior to any equipment or personnel being brought onto the site of the Work or the Project site, Certificates of Insurance in form and substance satisfactory to Buyer evidencing the required coverage below:

1. General Requirements. The insurance required to be purchased and maintained by Seller shall be as follows:

a. Include at a minimum the specific coverages and be written for not less than the limits of liability specified herein or required by laws or regulations, whichever is greater. Coverage requirements can be met with any combination of primary and excess limits.

b. Include products/completed operations coverage, which must extend for lawsuits brought in the United States to any product manufactured in the United States and shipped to any foreign country.

c. Include contractual liability insurance covering Seller's indemnity obligations.

d. Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least thirty (30) days prior written notice has been given to the Indemnified Parties.

2. Buyer, Engineer, and their officers, directors, shareholders, partners, employees, agents, consultants and sub-contractors.

a. Remain in effect at least until final payment and at all times thereafter when Seller may be correcting, removing, or replacing defective Work. Evidence of coverage must be provided through term of project.

b. With respect to completed operations insurance, and any other

insurance coverage written on a claims-made basis, remain in effect for at least two (2) years after final payment (and Seller shall furnish the Indemnified Parties evidence satisfactory to the Indemnified Parties of continuation of such insurance at final payment and one 1 year thereafter).

c. Contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance.

d. With respect to workers' compensation and employers' liability, comprehensive automobile liability, commercial general liability, and umbrella liability and, if applicable, transportation insurance, Seller shall require its insurance carriers to waive all rights of subrogation against the Indemnified Parties.

e. Comply with all applicable insurance laws of the country in which the Work is to be performed, including but not limited to, admitted and compulsory coverage.

3 Commercial General Liability Insurance (use ISO Commercial General Liability Policy Form 2002 Edition or equivalent). This insurance shall be occurrence type written in comprehensive form and shall protect the Seller, and the Indemnified Parties as additional insured, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include personal injury liability coverage, contractual liability coverage, completed operations and products liability coverage, and contain a per project aggregate endorsement. Seller's policy must be primary, with no contribution from Buyer coverage. Sellers insurance carrier must waive subrogation against Buyer.

4. Workers' Compensation and Employers' Liability Insurance. This insurance shall protect Seller against all claims under applicable state workers' compensation laws, including coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. Seller shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This policy shall include an "all states" or "other states" provision whether or not required by law (includes sole proprietors and partners). Seller's insurance carrier shall waive subrogation against Buyer. If leased workers are used, an Alternate Employer Endorsement shall be added to the U.S. Government extension endorsements as appropriate (U.S.L. & H., etc.).

5. Comprehensive Automobile Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect Seller and the Indemnified Parties as additional insureds, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the project Site whether they are owned, non-owned, or hired. Seller's insurance carrier must waive subrogation against Buyer.

6. Umbrella Liability Insurance. This insurance shall protect the Seller and the Indemnified Parties as additional insureds, against claims in excess of the limits provided under workers' compensation and employers' liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall at least follow the form of the primary insurance.

7. Equipment Insurance. Seller shall provide and maintain insurance or shall self- insure, against loss or damage to all property, whether owned or

leased by Seller, which is utilized by Seller to perform the Work and which is not permanently incorporated in the Facility, including without limitation, tools, construction equipment, protective fencing, scaffolding, and temporary structures. Seller waives any claim against the Indemnified Parties for loss or damage to such property. Seller shall include a similar requirement in its subcontracts or lower-tier purchase orders, and shall require its lower-tier Seller(s) to provide such a claim waiver for the benefit of Seller and the Indemnified Parties.

8. Seller expressly agrees that Buyer is authorized to withhold payments to Seller until Buyer receives evidence of insurance as required herein. In the event that a claim is presented against the Additional Insured Parties, and there is no insurance provided by Seller or the carrier providing such insurance disclaims or denies coverage, any such claims, loss, cost, expense, liability, damage or injury arise or are made, asserted or threatened against the Additional Insured Parties, and each of them, shall give Buyer the right to withhold from any payments due or to become due to Seller any amount the Buyer deems sufficient to protect and indemnify the Additional Insureds and each of them, from and against any and all such claims, loss cost, expense, liability, damage or injury, including legal fees and disbursements. Buyer, in its discretion, may require Seller to furnish a surety bond satisfactory to Buyer guaranteeing such protection, which bond shall be furnished by Seller within fourteen (14) calendar days after written demand has been made therefore.

9. Seller shall make this Article and these insurance requirements binding on all of its lower-tier Sellers, including, but not limited to, the duty to name the Additional Insured Parties as additional insured on the lower-tier Seller(s) insurance policy(ies) on a primary and non-contributory basis.

10. Professional Liability Insurance. In the event that any of the Work requires professional services by the Seller or its lower-tier Sellers, evidence of professional liability is required. The liability limits shall be not less than:

$1,000,000 each occurrence $1,000,000 general aggregate

11. Transportation Insurance. This insurance shall be of the "all risks" type and shall protect the Seller and the Buyer from all insurable risks of physical loss or damage to equipment and materials in transit to the Jobsite including, but not limited to, transit outside the United States via navigable waters, rail or truck and until the Buyer receives the equipment and materials at the Jobsite. The coverage amount shall be not less than the full amount of equipment and materials shipped. Transportation insurance shall provide for losses to be payable to the Seller and the Buyer as their interests may appear.

12. Include the following additional insureds in Articles 4.2 B.2., 3., 4., and 5. above.

City of Sandy
Stantec Consulting Services, Inc.

**ARTICLE 5 - SELLERS RESPONSIBILITIES**

**Modify Article 5.06A to read:**

"A. Replace wording "review and approval" in all Articles of 5.6 A of the General Conditions with 'review for compliance'."

**Add two new Articles after Article 5.06A that read:**

"1. Shop Drawings submitted as herein provided by Seller and reviewed by Engineer for conformance with the design concepts shall be executed in conformity with the Contract Documents unless otherwise required by Buyer.

2. When Shop Drawings are submitted of the purpose of showing the installation in greater detail, their review shall not excuse Seller from requirements included in the Contract Documents."

**Modify Article 5.06B:**

B. Insert "and issuance of a "Notice to Commence Fabrication" after "submittal."

**Add two new Articles after 5.06C.4. that read:**

"5. See Section 01340.

6. Shop Drawings and Sample submittals not conforming to requirements of this Article 5.6 and Section 01340 will be returned to Seller without action for resubmittal and the resulting delay shall be entirely the responsibility of Seller."

**Modify Article 5.06C. 6.:**

6. Shop Drawings and Sample submittals not conforming to requirements of this Paragraph 5.06 and Section 01 33 03, Submittals for Membrane Procurement Contracts, will be returned to Seller without action for resubmittal.

**Add new Article after 5.06D.2. that read:**

"3. Engineer's check and review of Shop Drawings and Samples, Standard Specifications and descriptive literature submitted by Seller will be only for general conformance with design concept, except as otherwise provided, and shall not be construed as:

a. permitting any departure from the Contract Requirements;

b. relieving Seller of the responsibility for any error in details dimensions or otherwise that may exist in such submittals;

c. constituting a blanket approval of dimensions, quantities, or details of the material or equipment shown; or

d. approving departures from additional details or instructions previously furnished by Engineer. Such check or review shall not relieve Seller of the full responsibility of meeting all of the requirements of the Contract Document."

**Add new Article after 5.06E.1. that reads:**

"2. Engineer will review an initial shop drawing submittal and one resubmittal for any particular item requiring a shop drawing. Items requiring more than two reviews the additional review time will be at the sole expense of the Seller. Engineer will log his time and expenses which will be used by the Buyer to calculate the cost of a deductive change order for the additional review time. Buyer will deduct these costs from the amounts due Seller on the next application for payment.

**Modify Article 5.06E. 2.:**

2. Engineer will review an initial shop drawing submittal and one resubmittal for any particular item requiring a shop drawing. Items requiring more than two reviews the additional review time will be at the sole expense of the Seller and shall not exceed, in the aggregate, $2,500.00. Engineer will log his time and expenses which will be used by the Buyer to calculate the cost of a deductive change order for the additional review time. Buyer will deduct these costs from the amounts due Seller on the next application for payment.

**Delete Article 5.08B in its entirety and replace with the following:**

"B. Seller warrants the guarantees to Buyer that all Goods and Special Services will materially conform with the Contract Documents, including any Samples approved by Engineer, and the Goods will be free from defects in material and workmanship. Engineer shall be entitled to rely on representation of Seller's warranty and guarantee."

**Add new item 3 under Article 5.08C:**

"3. for Membrane Modules, the provision of Section 01 74 00, Membrane

System and Module Warranty."

**Delete Article 5.08E in its entirety and replace with the following:**

"E. Buyer shall within warranty period, notify Seller of any breach of Seller's warranties or guarantees. If ~~Seller~~ provides such written notice within the Warranty Period, Seller shall, at ~~its~~ sole option ~~and as Buyer's sole remedy~~, repair or replace the parts or equipment that are the subject of the claimed breach or refund the purchase price therefore~~, if~~ Seller determines that any claimed breach is not covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. If Buyer receives notice of a suit or claim. If Seller fails to defend such suit or claim, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit. ~~The warranties contained herein are conditioned upon the Buyer not being in material default of any obligation to Seller.~~"

**Add Articles after 5.08E:**

"F. The Seller shall submit to the Buyer all Membrane warranty and guarantees documentation.

G. The Seller~~'s~~ warrants and guarantees to the Buyer include the concept of linear scalability as described in Article 7 of the Agreement, Article 8 of the General Conditions, Section 01 74 00, Membrane System and Module Warranty and elsewhere in the Contract Documents.

H. The provisions of the Seller's Membrane Module Warranty, including provisions ~~fur~~ membrane module replacement pricing, shall remain in effect as a continuing obligation.

I. All product warranties and performance guarantees shall only be enforceable if (a) all equipment is properly installed, inspected regularly and is in good working order, (b) all operations are consistent with Seller recommendations, (c) operating conditions at the Site have not materially changed and remain within anticipated specifications, and (d) no reasonably unforeseeable circumstances exist or arise."

Clarification: Add point J: "The M&W warranty shall start 12 months from startup and commissioning or 18 months after equipment delivery, whichever occurs first."

**Delete Article 5.09A and replace with the following:**

"A. Seller shall indemnify and hold harmless Buyer, Engineer, and their officers, directors, shareholders, partners, employees, agents, consultants, contractors and subcontractors from any and all claims, costs, losses, and demands or judgments for damages or claims (including but not limited to fees and charges of Engineers, Architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs), to the extent (i) caused by the negligent act or omission of Seller, or its officers, directors, shareholders, partners, employees, agents, consultants, contractors or subcontractors, or anyone for whom the Seller is responsible and (ii) any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death or damage to Buyer's property (other than the Goods and Special Services themselves)."

Clarification: add to end of paragraph "Unless attributable to bodily harm, willful misconduct, gross negligence or third-party claims, seller's liability to buyer shall not exceed 100% of the contract price and neither party shall be held liable for consequential, indirect or special damages."

**Add new Articles following 5.09:**

*"5.10 Access to Goods in Production*

A. The Seller shall provide representatives of the Buyer, testing agencies, and governmental agencies with jurisdictional interests proper and safe access to Goods in the process of production at reasonable times as is necessary for the performance of their functions in connection with the Contract Documents.

*5.11 Confidentiality of Documents:*

A. Subject to regulations governing Public Records in Oregon, all Special Services performed by the Seller, including but not limited to all drafts, data, correspondence, proposals, reports, and estimates compiled or composed by the Seller, pursuant to the Agreement, are for the sole use of the Buyer, its agents and employees. Neither the documents nor their contents shall be released to any third party without the prior written consent of the Buyer. This provision does not apply to information that (a) was publicly known, or otherwise known to the Seller, at the time that it was disclosed to the Seller by the Buyer, (b) subsequently becomes publicly known through no act or omission by the Seller, or (c) otherwise becomes known to the Seller other than through disclosure by the Buyer. Neither the documents nor their contents shall be released to any third party without the prior Written consent of the Buyer.

*5.12 Industry Standards:*

A. The Seller agrees that the Special Services rendered under this Agreement shall be performed in accordance with the standards customarily adhered to by an experienced and competent professional membrane filtration equipment supply firm using the degree of care and skill exercised by reputable professionals practicing in the same field of service. Where approval by the Buyer, the Engineer, or other representatives of the Buyer is required, it is understood to be general approval only and does not relieve the Seller of responsibility for complying with all applicable laws, codes, and good engineering practices.

*5.13 Maintenance of Records:*

A. The Seller shall maintain books, records, logs, documents and other evidence sufficient to record all actions taken with respect to the providing of Goods and Special Services, throughout the performance of the Agreement and for a period of ten years following completion of the obligations under the Agreement. The Seller further agrees to allow the Buyer to inspect, copy, and audit such books, records, documents and other evidence at all reasonable times. Upon request, the Seller agrees to provide the Buyer with backup copies for all electronic documents generated by the Seller in performing under the terms of this Agreement or to provide the Buyer with proof of insurance coverage for valuable papers and records. The Seller shall make available all requested data and records during normal business hours. Failure to make requested records available for audit by the date requested will result in the immediate termination of the Agreement.

*5.14 Cleaning*

A. The Seller, while on the Buyer's site, shall on a daily basis remove dirt, debris, waste and rubbish from its own working area and maintain desks, offices and control stations in a professional manner and dispose of used materials in an appropriate manner."

**ARTICLE 6 - SHIPPING AND DELIVERY**

**Delete Article 6.02A in its entirety and replace with the following:**

"A Seller shall deliver the Goods, excluding the membrane modules, F.O.B., the Point of Destination within a delivery window of 28 days after the Contract Times set forth in the Agreement, or other date agreed to by Buyer and Seller.

1. The membrane modules, spare parts and computer equipment (if applicable) shall be retained by the Seller at its location and will be delivered F.O.B. to the Point of Destination during the commissioning of the Goods."

**Delete Articles 6.02C and 6.02D in their entirety and replace with the following:**

"C The Contractor will provide facilities for receipt and unloading of the Goods at the Point of Destination. When the ~~equipment~~ has been received by the ~~Contractor~~, title shall pass from the Seller to the ~~Contractor~~. Additional costs arising from delivery

prior to or after the delivery window will be the responsibility of Seller."

**Change Article 6.03A to read:**

"A Risk of loss and insurable interests transfers from Seller to ~~Contractor~~ upon ~~Contractor's~~ receipt of the Goods. The ~~Contractor~~ shall be responsible for the unloading of the Goods and may reject Goods that visually appear to have been damaged during shipment."

**ARTICLE 7 - CHANGES: SCHEDULE AND DELAY**

**Revise Article 7.01B as follows:**

Replace 15 with 10; Replace 45 with 30.

**Add new Article after 7.01C:**

"D. Change Orders prepared by the Engineer covering changes which are required by the Buyer, or because of any request for Change Order of the Seller for a change to the Contract Time or Contract Price, shall be in writing and shall state the dollar amount or establish the method of payment, any adjustment in contract time and when negotiated prices ate involved, shall provide for the Seller's signature indicating acceptance using the form provided.

E. If notice to the surety of any change in the Procurement Agreement is required by the provisions of any Bond, the giving of such notice will be the Seller's responsibility, and the amount of each applicable Bond may be adjusted accordingly."

**Add new Article after 7.03A.3:**

"4. CPR form attached to this section is the instrument to be used to track and document individual changes in contract time or price which will then be used as detailed documentation for a Change Order."

**Revise Article 7.03B as follows:**

Replace 15 with 10.

**Add new Article after 7.03E:**

"F. Change Order Form: The Seller shall use the attached Change Order Form for all Change Orders associated with the Goods and Services. No additions or deletions to this form shall be allowed."

**ARTICLE 8 - BUYER'S RIGHTS**

**Modify Article 8.01A. 2. as follows:**

Insert, "and shall not exceed, in the aggregate, $2,500.00," after "facility".

**Delete Article 8.01A.3 in its entirety and replace with the following:**

"3. Seller shall bear all expenses, for inspections and tests at the Point of Destination, but Seller shall be entitled to reimbursement from Buyer for Seller's expenses for re- inspection or retesting if, on the basis of an initial inspection or testing, the installation of the Goods are determined to be improper or incomplete."

**Modify Article 8.01A.4 as follows:**

Replace 30 with 14.

**Modify Article 8.01C.1 as follows:**

~~Insert, "for a period of 11 months during the correction period," after "intended".~~ Addendum #3

**Modify Article 8.02A as follows:**

Insert, "or for such times as provided by a warranty provision that remains in effect after final payment as a continuing obligation," after "the expiration of the correction

period,"

**Delete Article 8.02C in its entirety and replace with the following:**

"C Remedying Non-Conforming Goods or Special Services

1. If Buyer notifies Seller in writing that the Goods are non-conforming, the Seller shall modify, repair or replace the Goods to remedy the non-conformance. Seller shall provide within 10 days the proposed remedy and a schedule that shall make the Goods conforming within a reasonable time.

2. If Buyer notifies Seller in writing that any of the Special Services are nonconforming or have delayed the Buyer's Project, the Seller shall promptly provide conforming Special Services acceptable to Buyer subject to the following provisions:

a. The Seller will be assessed Liquidated Damages for the delays in the timely delivery of Special Services until they are determined to be in conformance.

3. If the Seller fails to take action as required by the Buyer or the Engineer to remedy nonconforming Goods, after 15 days written notice to the Seller, the Buyer shall at its option remedy any such deficiency instead of requiring removal or replacement. Buyer acknowledges and agrees that Buyer, by exercising this option, voids any and all warranties for the Goods. Cost for the Buyer's remedy is subject to the provisions of Article 5.8 and Article 8.2E.

4. In an emergency where delay would cause serious risk of loss or damage, the Buyer may take such action as is necessary to avoid such risk of loss or damage without issuing prior notice or waiting for action by the Seller.

5. If the Goods are determined to be non-conforming as part of a warranty notice or claim pursuant to Article 5.8 or the warranty provisions of Section 01740, Membrane System and Module Warranty, the Seller shall be notified in writing that the applicable conditions for breach of contract or breach of warranty exist.

6. Cost of Remedy

a. If the Goods are determined to be non-conforming before the date of the Notice of Substantial Completion, and a remedy is required, the Seller shall pay for all costs of the remedy, including modification, repairs, removal, and replacement of the Goods.

b. If the Goods are determined to be non-conforming as part of a warranty. claim pursuant to Article 5.8, after the date of the Notice of Substantial Completion and prior to the end of the correction period for the Goods, and the Seller's remedy is to modify or repair the Goods.

c. If the Goods are determined to be non-conforming as part of a warranty claim pursuant to Article 5.8, after the date of the Notice of Substantial Completion and the Seller's remedy is the replacement of existing Goods, Goods shall be delivered to the Buyer F.O.B. Point of Destination. Buyer shall provide the labor associated with the removal and replacement of the non-conforming Goods provided by the Seller as a remedy.

d. In the event that the Seller's remedy involves a change to or addition of Seller's equipment, the Seller shall be responsible for all costs as described in Article 8.2.E for the remedy of the non-conforming Goods and to provide Special Services required for the remedy.

**Add new Article after 8.02C. 6.:**

"7. Goods repaired or replaced are not covered by any warranty except to the extent repaired or replaced by Seller, an authorized representative of Seller, or under specific instructions by Seller, in which cases, the Goods will be covered under warranty up to the end of the warranty period applicable to the original Goods."

**Modify Article 8.02E as follows:**

E. Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, re-testing and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods or Special Services or breach of warranties, including the correction or removal and replacement of the nonconforming Goods and the replacement of property of Buyer destroyed by the correction or removal and replacement of the non-conforming Goods, to the proportionate extent caused by Seller's breach of the warranty. In no event shall Seller be liable for any consequential, indirect, incidental, special, exemplary, or punitive damages, lost profits or revenues or diminution in value, including without limitation, remanufacturing costs and rework costs, de-installation, or re-installation costs.

**Add new items under Article 8.02E:**

"1. With respect to breach of contract claim by the Buyer the following provisions apply:

a. In the event that the Seller's membrane filtration system does not satisfy the conditions of linear scalability as described in the Contract Documents, and Seller's remedy is not agreeable to the Buyer, the Buyer shall declare Seller in breach of Contract in accordance with Article 11.4.B.

2. With respect to a breach of warranty claim by the Buyer, the following provisions apply.

a. In the event that the membrane modules are non-conforming due to defects in materials, workmanship, membrane integrity or irreversible flux loss as described in Section 01 74 00, Membrane System and Module Warranty, and the Seller's remedy is not agreeable to the Buyer, the Buyer shall declare a breach of warranty exists.

b. Buyer shall provide Seller with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach of warranty has occurred. Seller shall have ten days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure the alleged breach.

3. If incurred prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents and a commensurate reduction in the Contract Price. If the costs exceed the unpaid balance of the Contract Price, the costs in excess of the Contract Price shall be paid by the Seller to the Buyer. The provisions of this Article shall be in addition to all other rights and remedies available to the Buyer under the Procurement Agreement and any applicable laws."

**Delete Article 8.03 in its entirety and replace with the following:**

*"8.3 Correction Period*

A. Seller's responsibility for correcting all nonconformities in the Goods will extend for a period of one year after the date of the Notice of Substantial Completion, or for such longer period of time as may be prescribed by Laws or Regulations or by the terms of any specific provisions of the Contract Documents."

**ARTICLE 9 - ROLE OF ENGINEER**

**Add after Article 9.04A:**

"B. The acceptance at any time of materials or equipment by or on behalf of Buyer shall not be a bar to future rejection if they are subsequently found to be defective, inferior in quality, or not equal to the material or equipment specified or are not as represented to Engineer or Buyer."

**ARTICLE 10 - PAYMENT**

**Delete Section 10.01 in its entirety and replace with the following:**

*10.01 Applications for Progress Payments*

"A. Seller shall submit Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Contract Documents and also as Buyer or Engineer may reasonably require for review and approval. The timing and amounts of progress payments shall be as stipulated in the Agreement.

1. Applications for Progress Payments for Special Engineering Services

   a. The Seller shall submit Applications for Payment to the Engineer for review, completed and signed by the Seller. The Applications for Payment shall be submitted according to the following schedule:

      1) The first Application for Payment shall be submitted after the Engineer has reviewed and approved all pilot testing and the report.

      2) The second Application for Payment shall be submitted after the Engineer has reviewed and approved all Shop Drawings (Refer to Section 01 34 00, Shop Drawing Procedures; Tables A and B) and all other related submittals as required by the Contract Documents.

2. Applications for Progress Payments for Equipment:

   a. The Seller shall submit Applications for Payment to the Engineer for review, completed and signed by the Seller. The Applications for Payment shall be submitted according to the following schedule:

      1) The first Application for Payment shall be submitted following initial contract award.

      2) The second Application for Payment shall be submitted when the Buyer has issued a "Notice to Commence Fabrication."

      3) The third Application for Payment shall be submitted after the delivery of the Goods in accordance with Article 5 of the Agreement. The Application for Payment will be accompanied by a bill of sale and other documentation satisfactory to the Buyer warranting that the Contractor has received the Goods free and clear of all liens, charges, security interest, and encumbrances. Such documentation shall include releases and waivers from all parties who, during the Seller's execution of its responsibilities under the Contract Documents, might have obtained or

filed any such lien, change, security, or encumbrance.

4) The fourth Application for Payment shall be submitted after the "Notice of Substantial Completion" has been issued by the Engineer.

B. In the event of the Assignment of the Agreement from the Buyer to the Contractor, the payment procedures shall not be altered. The Buyer will provide payment directly to the Seller."

**Delete Article 10.02A.1. in its entirety and replace with the following:**

"1. Engineer's recommendation of payment requested in Applications for Payment for Shop Drawings will constitute a representation by Engineer, based on Engineer's review of the Application for Payment and the accompanying data that the Shop Drawings have been reviewed as required by the Contract Documents and Seller is entitled to payment of the amount recommended."

**Modify Article 10.02 A. 3. as follows:**

3. Engineer may refuse to recommend that all or any part of a progress payment be made, or Engineer may recommend nullifying all or any part of any payment previously recommended if, in Engineer's opinion, such recommendation would be incorrect or if on the basis of subsequently discovered evidence or subsequent inspections or tests Engineer considers such refusal or nullification necessary to protect Buyer from loss because the Contract Price has been reduced, Goods are found to be non-conforming, or Seller has failed to furnish acceptable Special Services.

**Modify Article 10.03A. as follows:**

A. Subject to Paragraph 10.02.A., the amounts of the progress payments will be as provided in the Agreement. Buyer shall within 30 days after receipt of each invoice from Seller pay the Seller. Buyer shall notify Seller promptly of any deficiency in the documentation and shall not unreasonably withhold payment.

Clarification: change "receipt of each invoice" to "the invoice date"

**Modify Article 10.04. as follows:**

Neither party will have any rights to set-off hereunder except to the extent agreed to be an undisputed claim. In any action related to Buyer's election to withhold payments due to Seller, Buyer shall bear the burden of proving default by Seller. and that its election to withhold was justified.

**Delete Article 10.05 and replace with the following:**

*10.05 Final Application for Payment*

Clarification: change "receipt of each invoice" to "the invoice date"

"A. After the correction period and following the completion of the Final Inspection as per Article 8.1.C, and after Seller has corrected all non-conformities to the satisfaction of Buyer and Engineer, furnished all Special Services, and delivered all documents required by the Contract Documents, Engineer will issue to Buyer and Seller a Notice of Acceptability. Seller may then make application for final payment following the procedure for progress payments. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents, a list of all unsettled claims and such other data and information as Buyer or Engineer may reasonably require."

**ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION**

**Delete Article 11.01A.1 in its entirety and replace with the following:**

"1. Buyer may not cancel this Agreement after Sales Confirmation unless all the details are approved in writing by the parties, including Buyer's agreement to pay a stated amount of termination charges. Unless otherwise agreed to in writing by Seller, the termination charges shall be as follows and, for certainty, such

amounts below shall include Seller's reasonable profit forming part of the Purchase Price based upon the percentages set forth.

| Termination Charge | Milestone |
|---|---|
| 0% of the Purchase Price | After Sales Confirmation but prior to release to purchase materials |
| 25% of the Purchase Price | After release to purchase materials but prior to release for fabrication |
| 75% of the Purchase Price | After release for fabrication but prior to Equipment Completion |
| 95% of the Purchase Price | After Equipment Completion but prior to release for shipment |
| 100% of the Purchase Price | After release for shipment |

2. The Seller shall be entitled to a reasonable allowance for overhead and profit with respect to all work on the Project completed in accordance with the Contract Documents prior to cancellation by the Buyer pursuant to this Paragraph 11.01."

**Add the following items after 11.04B.2.b:**

"c. Buyer may terminate for the following reasons, including but not limited to:

1) If the Seller commences a voluntary case under any chapter of the Bankruptcy Code, as now or hereafter in effect, of if the Seller takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to bankruptcy or insolvency

2) If a petition is filed against the Seller: under any chapter of said Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against the Seller under any other federal or state law in effect at the time relating to bankruptcy or insolvency

3) If the Seller makes a general assignment for the benefit of creditors

4) If a trustee, receiver, custodian, or agent of the Seller is appointed under applicable law, or under contract, whose appointment or authority to take charge of property of the Seller is for the purpose of enforcing a lien against such property or for the purpose of general administration of such property for the benefit of the Seller's creditors

5) If the Seller admits in writing an inability to pay its debts generally as they become due; or

6) If the Seller breaches the Procurement Agreement or any provision of the Contract Documents and such breach continues for a period of 15 days after written notice to correct the breach from the Buyer to the Seller

7) Fails to provide competent management and supervision, competent staff or materials or equipment meeting the requirements of the Procurement Agreement

8) Disregards laws or regulations of any public body having jurisdiction

9) Commits serious violations of approved or legislated safety requirements

10) Has assigned any part of the obligations under the Procurement Agreement without the Buyer's prior written consent

**ARTICLE 12 - LICENSES AND FEES**

**Add after Article 12.01B:**

"C. Seller grants Buyer a non-exclusive royalty free license to use any process or apparatus claimed in any patent owned by Seller but only to the extent that this license is required by Buyer to build and operate the Project described in this contract using membranes supplied by Seller. All other rights are reserved."

**Modify Article 12.02A. as follows:**

A. Subject to Paragraph 12.01.A, Seller shall indemnify and hold harmless Buyer, Engineer and their officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) as finally determined by a court of competent jurisdiction in any suit for infringement of any U.S. or Canadian patent (or European patent for Goods that Seller sells to Buyer for end use in a member state of the E.U.) that has issued as of the delivery date, solely by reason of the sale or normal use of any Goods sold to Buyer hereunder and from reasonable expenses incurred by Buyer in defense of such suit if Seller does not undertake the defense thereof, provided that BUYER promptly notifies Seller of such suit and offers Seller either (i) full and exclusive control of the defense of such suit when Goods of Seller only are involved, or (ii) the right to participate in the defense of such suit when products other than those of Seller are also involved. Seller's warranty as to use patents only applies to infringement arising solely out of the inherent operation of the Goods according to their applications as envisioned by Seller's specifications.

**Modify Article 12.02B. as follows:**

Replace "within a reasonable time of receiving notice thereof" with "promptly when receiving notice thereof."

**Delete Article 12.02D and replace with the following:**

"D. If determination is made that Seller has infringed upon intellectual property rights of another, Seller may, at its election, and as Buyer's sole and exclusive remedy under this indemnification provision, (i) obtain the necessary licenses for Buyer's benefit, or (ii) replace the Goods and provide related design and construction as necessary to avoid the infringement at Seller's own expense or, (iii) remove the infringing Goods and refund to the Buyer the purchase price."

**ARTICLE 13 - DISPUTE RESOLUTION**

**Delete Article 13.01 in its entirety and replace with the following:**

*13.1 Dispute Resolution Method*

A. Disputes between the Buyer and Seller will be resolved as set forth in Article 13.3.

*13.2 Mediation – Not Used*

*13.3 Arbitration*

A. All Claims or counterclaims, disputes, or other matters in question between Buyer and Seller arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by Article 10.7) will be decided by binding arbitration in

accordance with the rules of the American Arbitration Association, subject to the limitations of this Article 13.3. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. No demand for arbitration of any Claim or counterclaim, dispute, or other matter that is required to be referred to Engineer initially for decision in accordance with Article 9.5 will be made until the earlier of: (i) the date on which Engineer has rendered a written decision, or (ii) the 31st day after the parties have presented their final evidence to Engineer if a written decision has not been rendered by Engineer before that date. No demand for arbitration of any such Claim or counterclaim, dispute, or other matter will be made later than 30 days after the date on which Engineer has rendered a written decision in respect thereof in accordance with Article 9.6; and the failure to demand arbitration within said 30 day period will result in Engineer's decision being final and binding upon Buyer, and Seller. If Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but will not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

C. Notice of the demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the 30 day period specified in Article 13.3.B, and in all other cases within a reasonable time after the claim or counterclaim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statute of limitations.

D. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and

2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings

E. The award rendered by the arbitrators will be final, judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal."

**Request for Information (RFI)**

**Project:** **City of Sandy** **RFI No:** _____
**Alder Creek Water Treatment Plant Upgrade Project**

**Stantec Project No.:** 2002006267 **Date:** _____

**Owner Project No.** _____ **Contractor Project No.** _____

---

**Request:**

_____ _____ Owner _____ Contractor _____ Stantec
Engineering Signature

---

**Reply:** **Date:**

_____ _____ Owner _____ Contractor _____ Stantec
Engineering Signature

**Contract Change Order Agreement**

**Project:** City of Sandy
Alder Creek Water Treatment Plant Upgrade Project

**Date:** _____

**Change Order No.** _____

**Contractor:** _____

**Stantec Project No.:** 2002006267

**Contractor Project No.** _____

SUMMARY OF PROPOSED CHANGE: _____

| ITEM | QUANTITY | UNIT PRICE | INCREASE OR DECREASE |
|---|---|---|---|
| **A.** | | | |
| **B.** | | | |
| **SUBTOTAL** | | | |
| **FINAL CONTRACT PAYMENT** | | | |

Additional contract time for substantial completion: _____ calendar days.

The Contractor accepts the above adjustment to the contract. By accepting this change, the Contractor agrees that it shall be full payment and final settlement of all claims for contract time and for direct, indirect, and consequential costs, including costs of delays related to any work either covered or affected by the change.

SIGNATURES:

Contractor: _____ Date: _____

Engineer: _____ Date: _____

APPROVED BY: _____ _____ _____
City of Sandy Date Authorized Official

**Change Proposal Request (CPR)**

**Project:** **City of Sandy**
**Alder Creek Water Treatment Plant Upgrade Project**

**CPR Date:** _____

**CPR No.** _____

**Stantec Project No.:** 2002006267

**Date Sent to Contractor:** _____

**Owner Project No.** _____

**Date Received from Contractor:** _____

We hereby request the cost of the following proposed change in your contract on subject project and the return of this completed form. A breakdown of your costs shall be attached. Do not proceed with this work until authorized by Owner.

Description of the proposed change: _____

Proposed by: _____
Title: _____

All work shall be in accordance with the terms, stipulations, and conditions of the original Contract Documents. If the work herein provided is approved by Change Order, the time of completion will be increased by ___ calendar days.

Add: _____
Deduct: _____
Net Changed: _____
Contractor: _____
By: _____
Date: _____

| | |
|---|---|
| Stantec Recommendation: | _____ Approval<br>_____ Non Approval |
| By: _____ | Date: _____ |
| Reason for Non Approval: | _____ |
| | |
| | |

OWNER'S ACTION: _____ ACCEPTED _____ NOT ACCEPTED

BY: _____ Date: _____

COMMENTS: _____

**Certificate of Substantial Completion**

| Project Name: **Alder Creek Water Treatment Plant Upgrade Project** | Stantec Project No: 2002006267 |
|---|---|
| | |
| Project Owner: City of Sandy | Owner's Project No: |
| Project Contractor: | Date of Contract: |
| This Certificate of Substantial Completion Applies to:<br>D All work under the Contract Documents D The following specific portions: | |
| Date of Substantial Completion: | |

**The work performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion of the project or portion thereof designated above is hereby declared and is also the date of commencement of warranties required by the Contract Documents, except as stated below.**

A list of items to be completed or corrected, is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. The date of commencement of warranties for items on the attached list will be the date of final payment unless otherwise agreed to in writing.

| The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be provided in the Contract Documents except as amended as follows:<br>D Amended Responsibilities D Not Amended |
|---|
| Owner's Responsibilities: |
| |
| |
| |
| Contractor's Responsibilities: |
| |
| |
| |
| The following documents are attached to and made part of this certificate: |
| |
| |

**This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.**

| | |
|---|---|
| Executed by the Engineer | Date: |
| Accepted by the Contractor | Date: |
| Accepted by the Owner | Date: |

END OF SECTION

# SECTION 00 83 17

# INSURANCE SPECIFICATIONS FOR SELLER

## GENERAL LIABILITY

- ISO Commercial General Liability Policy form, current edition.
- $1,000,000 Per Occurrence limit.
- $2,000,000 Products/Completed Operations Aggregate limit.
- $2,000,000 General Aggregate limit.
- Per Project or Job Site Aggregate.
- BUYER, ARCHITECT/ENGINEER and their employees, subsidiaries, subconsultants and assigns must be designated as Additional Insureds for both Ongoing and Completed Operations.
- SELLER's policy must be Primary, with no contribution from BUYER's coverage.
- SELLER's insurance carrier must waive subrogation against BUYER.

## COMMERCIAL AUTO

- $1,000,000 Combined Single Limit of coverage.
- Coverage must be provided for all owned, non-owned, and hired vehicles.
- SELLER's insurance carrier must waive subrogation against BUYER.

## WORKER'S COMPENSATION

- Statutory coverage provided for the state in which operations are undertaken, **whether or not required by law (includes sole proprietors & partners).** Sole proprietors may substitute a minimum premium/zero payroll policy obtainable from their agent.
- Employer's Liability limits of $500,000/$1,000,000/$500,000.
- CONTRACTOR's insurance carrier shall waive subrogation against BUYER.
- If leased workers are used, an Alternate Employer Endorsement shall be added.
- U S Government extension endorsements as appropriate (U.S.L.& H., etc.).

## UMBRELLA OR EXCESS LIABILITY

- $2,000,000 limit minimum.
- Must follow form with all primary policies.

## OTHER

- Insurance carrier(s) providing coverage shall be rated at least A-VII by A. M. Best.
- SELLER shall provide Property Insurance (Builder's Risk) for the project. Property Insurance shall cover all BUYER-supplied materials and equipment.
- SELLER shall be responsible for any Property Insurance deductibles.
- SELLER shall bear all responsibility for loss to owned tools and equipment.
- Certificate of Insurance shall provide for 30 days' prior written notice in cancellation clause.
- Certificate of Insurance must indicate above coverage elements.
- BUYER reserves right to require certified copies of policies and/or endorsements.
- Project Management Protective and Boiler & Machinery coverage is not required.

**END OF SECTION**

# SECTION 01 01 00 SUMMARY OF GOODS AND SPECIAL SERVICES

## PART 1 -- GENERAL

1.1 DESCRIPTION

A. Description of Work

1. The summary of the Goods and Special Services described in this Section is an overall summary of the responsibilities of the Seller and its relation to the Buyer, Engineer, and Contractor. It does not supersede the specific requirements of other Contract Documents.

2. Project Background.

a. The Goods and Special Services consist of designing and furnishing containerized membrane filtration equipment required for the City of Sandy's Alder Creek Water Treatment Plant (WTP). The Goods and Special Services also consist of furnishing manufacturer-trained personnel for the installation, commissioning, acceptance testing, training, and operations assistance as specified.

b. The following narrative is provided as a general description of the project background and goals. Design or operating parameters and proposed improvements beyond those that relate to this project are provided as information based upon the current understanding of the project and shall not constitute the basis of design and/or operation of the current or proposed facilities.

c. The WTP will use Alder Creek as source water. The water system will have a firm capacity of 2.0 MGD. The term 'firm capacity' means that the capacity can be achieved with the largest primary membrane unit out of service. A membrane unit shall consist of a membrane module rack, dedicated feed pump and dedicated strainer.

d. Water will be obtained from Alder Creek using a fixed-level intake. The raw water will be coagulated with polyaluminum chloride (PACL) or aluminum chlorohydrate (ACH), dosed with sodium hydroxide for pH control, and sodium hypochlorite added for oxidation, and will pass through a static mixer. The purpose of coagulation/flocculation is to coagulate and remove natural organic matter (NOM) and color to comply with the regulatory requirements for disinfection byproduct (DBP) control. Coagulated raw water will be stored in the MF Feed Tank outside of the containerized membrane systems and will receive a minimum of two-minute reaction time prior to entering the membrane feed pumps.

e. The raw water will enter the containerized membrane systems under hydrostatic pressure available from the MF Feed Tank. Membrane feed pumps located inside each containerized system, will pump water through automatic backwashable strainers that are designed to remove algae and other deleterious materials.

f. The membrane system will be pressure-type. Water will pass through a unit modulating influent control valve and enter the treatment unit. Water is filtered across the membrane using differential pressure. The filtered water is then discharged.

a) The system will use a periodic Air Scour – Backwash process to remove accumulated contaminants from the membranes. The process utilizes air on the feed side of the membrane with filtered water to scour the membrane fibers. The waste from the process is then discharged to the solids drying beds.

b) The system will be periodically cleaned using a Maintenance Clean (MC) process which is a chemical washing procedure. Citric acid or sodium hypochlorite solution is used to clean the membranes. Once the MC process is complete, the remaining solution in the filtration unit is neutralized, dechlorinated, and flushed to a CIP holding tank.

c) The membrane system will use a Clean-In-Place (CIP) process using a citric acid, sodium hydroxide, or sodium hypochlorite solution. The solution is heated and circulated through the membrane unit and returned to the CIP Tank in each containerized system. Once the cleaning process is complete, the CIP solution is recovered in the CIP Tank and the remaining solution in the filtration unit is neutralized, dechlorinated, and flushed to the CIP holding tank.

g. After the water is filtered, chlorinated for disinfection, pH adjusted, it will be discharged to a chlorine contact tank. The Buyer's high service pump station will pump the potable water into the distribution system for customer's use.

h. Backwash wastewater will discharge to a collection manhole. It will flow to a backwash holding pond.

i. Process residuals from the CIP system will be neutralized, dechlorinated, and discharged to a CIP holding tank in accordance with the requirements of the Buyer.

j. Each membrane filtration system will incorporate a direct integrity test feature to determine that the membranes are integral and not compromised.

1.2 WORK COVERED BY PROCUREMENT DOCUMENTS

A. In general, the Goods and Special Services include:

1. Scope of Supply described in Section 11 30 00, Hollow Fiber Membrane Equipment.

a. Containerized membrane filtration units (excluding interconnecting pipework as shown on the Drawings).

b. Membrane filtrate monitoring system.

c. Process Air Compressor.

d. Blowers for air scour.

e. Feed/Backwash Pumps.

f. Air diaphragm chemical transfer pumps for citric acid, calcium thiosulfate, sodium hydroxide and sodium hypochlorite used in the membrane system cleanings.

g. Strainers

h. Clean-In-Place (CIP) and Neutralization Pumps.

i. Electrical control panels for the MF equipment.

j. Process Logic Controllers (PLCs) for the MF equipment.

k. Human Machine Interface (HMI) for MF and other equipment.

l. Field-mounted instrumentation including:

1) Switches.

2) Gauges.

3) Flowmeters.

4) Pressure indicating transmitters.

5) Turbidity meters.

m. Other analytical instrumentation.

2. Special Engineering Services and Drawings supplied by the Seller shall include, but are not limited to, the following:

a. Design of the Goods provided by the Seller.

b. Submittal of Shop Drawings and Samples.

c. General arrangement drawings of membrane units and of interconnecting piping between membrane filtration treatment trains.

d. General arrangement drawing of Compressed Air/Aeration Equipment.

e. P&ID's for Seller furnished systems and systems denoted to be controlled by Seller's control system.

f. Electrical Drawings of Seller furnished systems.

g. PLC (remote I/O racks) Unit Panel Drawings for Seller furnished equipment.

h. Participate in meetings and assistance to the Buyer, Engineer, and Contractor during the design.

i. Any changes required by the Seller to coordinate the design with the Engineer for the membrane system.

3. Special Services shall include but are not limited to the following:

a. Scheduling of equipment delivery, witnessing unloading and unpacking of Seller supplied equipment, and inspecting/inventorying equipment.

b. Training of Contractor.

c. Operational and Maintenance Manuals for all equipment provided.

d. Oversee the setting of membrane filtration equipment.

e. Review of equipment installation.

f. Calibration of Seller supplied instrumentation.

g. Commissioning of the Goods.

h. Equipment and services for demonstration/performance testing.

i. Acceptance testing.

j. Operator training.

k. Correction period service visits.

l. Membrane Module and System Warranty.

4. Project responsibilities:

a. Provide design support to Engineer.

1) The Seller shall provide the Engineer with ~~design assistance and~~ [Addendum #5] review of the General Arrangement and detail drawings for the interconnecting piping between membrane units and between the membrane filtration system and support facilities (i.e., raw water supply, clearwell, backwash waste pipeline, cleaning systems, air systems, etc.).

b. Participation in meetings and assistance to the Buyer and the Engineer during the installation, commissioning and acceptance testing of the Goods.

c. Respond to requests for information (RFIs) and provide field support during construction.

d. Shop Drawing, Installation Manual, Operation and Maintenance (O&M) Manual and other miscellaneous submittals. Refer to Section 01 34 00, Shop Drawing Procedures.

e. Attend/participate in Engineering/Progress Meetings during the design, construction, commissioning, and acceptance testing of Seller provided equipment.

f. Any changes required by the Seller for coordination of the design with the Engineer for the membrane system.

g. Design and programming of the PLC and human machine interface (PLC/HMI) system for the WTP and membrane system, including but not limited to:

1) Design and programming of operator interface screens, data logging and reporting system.

2) Coordination between Seller provided PLC and other Buyer provided PLC/SCADA systems.

3) Programming of PLCs and HMIs supplied with each system.

4) Factory acceptance testing of PLC system.

5) Cooperation and coordination with the Engineer on development of the Seller's HMI/SCADA system.

5. The summary of the Good and Special Services described in this section is an overall summary of the responsibilities of the Seller and his relation to the Buyer.

a. It does not supersede the specific requirements of other Procurement Documents.

B. Special Services:

1. Provide authorized representatives of the Seller, factory trained and experienced in the technical applications, installation, operation and maintenance of Goods to perform each of the Special Services required.

a. Sales representatives or agents of the Seller will not be accepted.

b. The only exception to this is that Seller's sales representative may represent Seller during delivery of Goods.

2. Representatives are subject to acceptance by Engineer.

3. Once assigned, no substitute representatives will be allowed unless prior written approval by Engineer has been given.

4. Where specific time is allocated for a particular Special Service, the time expended shall be documented by the Seller and Buyer at the time the Special Service is provided.

a. Provide documentation to the Buyer on a monthly basis.

1) Documented hours shall be reconciled by the Buyer and Seller on a monthly basis.

b. At the conclusion of the Special Service, additional hours provided at the request of the Buyer or hours specified but not used shall be agreed to between the Seller and the Buyer.

1) Based on the per diem rate provided in the Proposal, the contract amount will be adjusted.

5. Seller to provide one representative selected to be the most qualified to represent the Seller for the individual Special Service provided.

a. The use of multiple representatives for any particular Special Service shall have prior approval by the Engineer.

C. Chronological Overview of Special Services and Meetings:

1. Project Kick-Off Meeting:

a. Review project requirements, introduce team members and establish communication protocol.

b. Seller to include four (4) hours for one (1) virtual MS Teams meeting.

2. Coordination Meeting (P&ID Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the P&ID Shop Drawing Submittal.

b. Attend virtual MS Teams meeting after Engineer review of P&ID Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

3. Coordination Meeting (Single Line Piping Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the Single Line Piping Shop Drawing Submittal.

b. Attend virtual MS Teams review meeting after Engineer review of Single Line Piping Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

4. Coordination Meeting (Equipment Data Technical Cut Sheet Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the Equipment Shop Drawing Submittal.

b. Attend virtual MS Teams review meeting after Engineer review of Equipment Data Technical Cut Sheet Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

5. Coordination Meeting (Electrical Power, Instrumentation Power and Control Wiring, and electrical equipment data technical cut sheets Shop Drawing Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the Electrical Power, Instrumentation Power and Control Wiring Drawing and electrical equipment data technical cut sheet Shop Drawing Submittal.

b. Attend virtual MS Teams review meeting after Engineer review of Electrical Power, Instrumentation Power and Control Wiring, and electrical equipment data technical cut sheets Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

6. Final Facility Design Integration:

a. Provide information and assistance to the Buyer and Engineer to coordinate and integrate Goods provided by Seller with the remaining interrelated systems designed by the Engineer.

b. Attend three (3) separate virtual MS Teams meetings with the Buyer and Engineer for integration of Goods into facility design.

c. Seller to include cost of one (1) eight (8) hour day for each meeting.

d. Integration shall include review by the Seller of the membrane tank(s) and/or skids(s) and pump orientations to confirm layout protects the membranes from excessive hydraulic forces that could damage the membranes or impact warranty.

e. Integration shall include review by the Seller of the membrane inlet channel/piping configuration to confirm the Seller's feed water conditions to the membrane equipment are met under all standard operating scenarios.

f. Initial meeting will be tentatively scheduled two (2) weeks following project kickoff coordination meeting.

1) The second meeting will be scheduled at the initial meeting.

2) The third meeting will be scheduled at the second meeting.

7. Receipt of Goods:

a. Verify and document that Goods are properly delivered and unloaded and that storage requirements are clearly communicated to the Contractor.

b. Provide construction site representation during delivery of Goods including all partial shipments.

c. Seller to include in the bid all the costs associated with delivery of Goods to the project site.

1) Buyer will not be responsible for additional costs associated with partial shipments or delivery of goods.

8. Pre-Demonstration Period:

a. Assist Contractor with supervision of the installation of Goods.

1) Coordinate services with Contractor's overall construction schedule.

a) Assume five (5) four (4) day trips (32 hours on site each trip) for supervision assistance along with all time required for travel to and from the site as well as expenses.

b) Be present to supervise the assembly and/or installation of:

(1) Membrane Tank(s) including chemical storage and neutralization, backwash storage, and membrane tanks and/or skids.

(2) Membrane blowers, air compressors and pumps and/or pump skids.

(3) Process control valves external to the membrane tanks or skids.

(4) Process control valves and piping internal to the membrane tanks or skids that are not pre-piped and/or factory installed.

(5) Control panels and/or valve panels.

(6) Membrane racks.

b. Equipment Startup and Training:

1) Provide startup and operator training services for Seller provided equipment.

2) Cost of these services is included in Seller's bid price for supplying Goods.

a) Duration of this phase is dependent on the quality of the Seller's equipment and programming.

b) Seller to assume no more than one (1) piece of equipment can be started in one (1) eight (8) hour day with one (1) training session for operation and maintenance personnel in said eight (8) hour day.

3) Seller may utilize representatives from air compressor, blower, pump, and other bought out equipment for installation assistance of Seller's purchased equipment.

a) Seller remains responsible for coordination and quality of Special Services if such representatives are used.

4) Training

a) Assist Contractor in training Buyer's personnel on the operation and maintenance of Goods.

9. Functional Demonstration:

a. Assist Contractor in demonstrating the functional integrity of the mechanical, electrical and control systems related to the Goods.

b. Cost associated with this phase of the work is included in the Seller's price of the Goods.

c. Duration of this phase is dependent on the quality of the Seller's equipment and programming.

10. Performance Demonstration:

a. Demonstrate and document that the Goods provided meet the operational criteria specified and, if performance does not meet specified criteria, provide corrective action to meet those criteria.

b. Duration of this phase is dependent on the quality of the Seller's equipment and programming.

11. Acceptance Testing:

a. Demonstrate the Goods supplied meet the minimum performance requirements of the contract.

b. Duration of this phase is dependent on the quality of the Seller's equipment.

12. Operations Assistance:

a. Provide operational assistance to the Buyer over the period of one (1) year.

b. Assume three (3), two (2) day trips (16 hours on site each trip) for operational assistance along with all time required for travel to and from the site as well as expenses.

c. Participate in a two (2) day on-site warranty inspection at the end of the correction period.

D. The WORK is located near Boardman Oregon as described in Division 00.

1.3 WORK BY OTHERS

A. Individual Party Responsibilities:

1. Engineer's Responsibilities:

a. Facility Design:

1) Overall facility design.

2) Design/specification of yard piping (raw, potable, residuals).

3) Design/specification of Raw Water Supply Piping/Valves up to containerized membrane systems.

4) Design/specification of filtered water piping/valves from containerized membrane System Buyer's chlorine contact tank.

5) Design/specification of the bulk chemical feed facilities (e.g., caustic soda, sodium hypochlorite, aluminum chlorohydrate).

6) Design/specification of the Recovery/Maintenance clean interconnecting piping.

7) Design/specification of chlorination facilities.

8) Design/specification of service water pumps.

9) Design/specification of electrical motor control centers (MCCs) and conduit schedules.

10) Design/specification Structural Elements of Facility, including awning that containerized units will be placed under..

11) Preparation of bidding documents for Contractor.

12) Design/specification of waste washwater handling facilities.

b. Project Responsibility:

1) Review and approval of shop drawing submittals.

2) Review of Applications for Payment.

3) Review of Applicable Building Codes.

4) Assist Buyer to obtain required permits.

5) Observation during installation and acceptance testing.

2. Contractor's Responsibilities:

a. Constructing the treatment facility, including any lifting/moving equipment associated with the building structure.

b. Receiving, unloading, and storing of all equipment at the project site.

c. Installation of all Containerized Membrane Filtration Equipment and other equipment provided by Seller.

d. Submittal, purchase, and installation of equipment specified by the Engineer and denoted on the Drawings.

e. Installation of all yard piping.

f. Installation of interconnecting piping between Containerized Membrane Filtration Units.

g. Installation of electrical systems and operator interfaces.

h. Corrective assistance during equipment commissioning.

i. Administer Seller's Contract, if assigned by the Buyer.

j. Other work as identified in the Contract Documents.

3. Buyer's Responsibilities:

a. Provide operator(s) for training.

b. Obtain permits as required.

c. Operation of the treatment facilities in accordance with Seller's recommendations.

d. Payment to contracted parties.

e. Timely responses to RFIs and design decisions.

f. Provide meeting locations and attend meetings.

g. Provide any applicable Buyer standards.

h. General oversight of Contractor.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 08 00 IDENTIFICATION AND TAGGING

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. Provide for each piece of tagged equipment supplied, provide a noncorrosive identification tag firmly attached and permanently engraved with the tag number.

2. The equipment number used by the manufacturer shall be consistent with the number used to identify the equipment in parts listings and other O&M documentation. The Seller's proposed tagging scheme shall be consistent with paragraph 2.2 and will be submitted to the Engineer per Section 01 34 00, Shop Drawing Procedures. Where possible, equipment tags shall be affixed to the equipment by the equipment manufacturer prior to delivery to the Contractor.

3. The Seller shall be responsible for providing all identification tags for equipment provided loose for installation by the Contractor.

4. For all tagged devices supplied, the Seller shall develop an "Equipment Cross Reference Schedule" that matches the tag to the equipment. Separate Schedules shall be provided for Equipment, Instruments, Valves, Motors, and Input/Output (I/O) Control Loops. The schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range and other pertinent information. The Equipment Cross-Reference Schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

B. Reference Specifications

1. Section 01 34 00, Shop Drawing Procedures

2. Section 01 67 00, Acceptance Testing of Membrane Equipment

3. Section 11 30 00, Hollow Fiber Membrane Equipment

C. Coordination

1. Coordinate the tagging of all equipment provided with the Buyer's asset tagging and management system.

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. Shop Drawings

1. Drawings and Samples

a. Provide tagging information as part of the Second Shop Drawing Submittal

b. Submit a complete listing of all equipment furnished along with both equipment manufacturer's (SKU) identification number and tag number for approval.

c. Submit the "Cross Reference Schedule" approved equipment manufacturer's (SKU) identification number and tag number for each piece of equipment furnished in electronic format for records.

1.04 SUBMIT THE PRODUCT DELIVERY STORAGE AND HANDLING

A. Refer to Section 01 61 00, Transportation and Handling of Goods.

**PART 2 -- PRODUCTS**

2.01 PROCESS SYSTEM DESIGN AND PERFORMANCE - NOT USED

2.02 EQUIPMENT DESIGN AND FABRICATION

Clarification: custom labeling is not included due to time constraints. An example of tagging is in Appendix L

A. General

1. Tagging

a. Tagging is used to identify facility, location / area, process, relative position within a process, and related systems. The purpose of tagging is for operations and maintenance personnel to be able to identify the equipment in the field.

b. Tag numbers are assigned to the placement of the equipment and remain if the actual equipment is replaced.

c. All process equipment, valves, instruments and controls will be given a tag.

d. Equipment numbers are assigned to a specific equipment item for the life of the item. When the equipment item is moved from the process, the equipment tag goes with the equipment item.

e. Tag numbering example

| Facility Code | | Location Code | | | Equipment Code | |
|---|---|---|---|---|---|---|
| Facility | Process Area | Process Location | Unit Number | Component ID | Sequence Number | Subprocess Sequence Number |
| Alder Creek WTP | MF | Unit | 01 | P | 10 | 30 |

f. All Component, Sequence Numbers, and Sub-Process Sequence Numbers for equipment contained as part of a duplicated process shall be the same component, sequence and sub-process designation. For example, all the MF Unit feed or filtrate pump(s) shall carry the final designation as P-1030. The designator for the Unit is contained in the Unit Number.

g. The Sequence Number and Sub Process Sequence Number shall not be duplicated for different Components. For example, a Flow Indicating Transmitter FIT-2020 shall not have a corresponding butterfly Valve BFV - 2020.

2. Equipment identification tags shall be provided for all equipment furnished by the Seller including:

   a. Seller Equipment (i.e., Units)

   b. Component Equipment (i.e., Pumps, Blowers, Compressors, Tanks)

   c. Instrumentation (i.e., Switches, Meters, Transmitters, and Analyzers)

   d. Mechanical Equipment (i.e., valves as shown on the P&ID's)

   e. Control Panel and Enclosures

   f. Miscellaneous items shown on the P&ID's

3. Each device shall be tagged to identify its number both in text formats. Identification numbers shall be displayed on the outside of equipment enclosures and panels. The tag size shall be a minimum of 1.5 inches by 3.5 inches. The tag number shall be engraved into the tags and shall have a minimum of 3/16-inch high alpha-numeric characters. The Seller shall include a separate Bar- Code identification tag to reflect the tag number using Code 39 and printed in a minimum of 24 point font size. Bar-codes shall be printed on adhesive-backed labels rated for exterior applications for both adhesion and fading for a minimum of seven years exposure. The Bar-Code shall be identifiable by the Buyer.

4. Tags shall be attached using stainless steel self-tapping machine screws where possible. If the use of a stainless steel screw is not possible, provide a stainless steel chain or stainless steel wire (18 gauge min) and affix to a non-removable part of the device.

B. Equipment Design Requirements (for equipment and processes design by others)

1. Equipment Tags

   a. Information to be permanently engraved onto the tag shall include the identifying tag number, equipment, manufacturer, model number, and part number.

   b. For valves, where applicable, include the valve model and the actuator model.

   c. Use 1/8-inch thick laminated phenolic for engraving composed of core, laminated on both sides with a matte (non-glare) finish cover sheet. Core to be black; cover sheet to be white. Tags shall be engraved with 3/16-inch letters, minimum

   d. Affix the bar-code, on the reverse of the tag.

e. Mounting holes to be centered on width and 1/4 inch from each end.

2. Control Panel Tagging:

a. All sensors and field instruments mounted on or within control panels and enclosures shall have the identification tag installed so that the engravings are easily visible to service personnel.

b. Equipment Asset tagging shall be provided for instrumentation located in control panel enclosures. Equipment Information shall be located on the front of the panels.

c. Tagging shall also be used to denote the function of all panel enclosure electrical devices including switches, lamp indicators, potentiometers and panel mounted instruments.

d. Control Panel Tags shall be constructed as follows:

1) 1/8-inch-thick laminated phenolic for engraving composed of core, laminated on both sides with a matte (non-glare) finish cover sheet.

2) Core to be black; cover sheet to be white

3) Tags shall be engraved with 3/16-inch letters, minimum

4) Mounting holes to be centered on width and 1/4 inch from each end.

5) Information to be permanently engraved onto the tag shall include the identifying tag number, manufacturer, model number, and part number

6) The tags shall be fastened to the control panel device with self-tapping stainless steel screws. Where fastening with screws is not permitted or impractical, the tags shall be attached to the device using permanent adhesive.

**PART 3 -- EXECUTION**

3.01 GENERAL

A. Verify the tagging of equipment as part of the Commissioning of the Goods, Refer to Section 01 67 00, Acceptance Testing of Membrane Equipment.

B. Provided custom labels as required to identify equipment and piping within the facility. Coordinate colors With the Buyer, however the general rules apply.

1. Feed - Green with white lettering

2. Filtrate - Blue with white lettering

3. Waste - Brown with white lettering

4. CIP System - Orange with black lettering
5. Chemical Hazard - Yellow with black Lettering
6. Compressed Air -Green with white lettering
7. Process Air- Green with white lettering

C. Label all piping at each membrane unit termination point. Denote direction of flow for single direction lines.

D. Label all piping within the ancillary support facilities including:

1. Clean-in-Place equipment
2. Compressors / Blowers
3. Reverse Filtration/Chemically Enhanced Backwash

END OF SECTION

# SECTION 01 09 10 REFERENCE STANDARDS

## PART 1 - GENERAL

1.1 SUMMARY

A. Applicable Publications: Whenever in these specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is indicated, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Contract is advertised for Proposals shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth in the specifications or shown on the Drawings will be waived because of any provision of or omission from said standards or requirements.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The SELLER shall construct the Goods in accordance with the Contract Documents and the referenced portions of those referenced codes, standards, and specifications.

B. Reference standards include, but are not necessarily limited to, the following:

1. American National Standards Institute (ANSI)
2. American Society for Testing and Materials (ASTM)
3. American Water Works Association (AWWA)
4. American Welding Society (AWS)
5. Anti-friction Bearing Manufacturers Association (AFBMA)
6. Canadian Standards Association (CSA)
7. Hydraulic Institute (HI) Clarification: space constraints prevent meeting criteria of pipe lengths and pump inlet/outlet velocities
8. Institute of Electrical and Electronics Engineering (IEEE)
9. National Electric Code (NEC)
10. National Electrical Manufacturers Association (NEMA)
11. National Sanitation Foundation (NSF)
12. Underwriters Laboratory, Inc. (UL)
13. ~~International Building Code (IBC)~~ [Addendum #5]

C. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and direction prior to ordering or providing any materials or furnishing labor. The SELLER shall bid for the most stringent requirements.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 09 20 ABBREVIATIONS AND SYBMOLS

## PART 1 -- GENERAL

### 1.1 DESCRIPTION

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these specifications, the following acronyms or abbreviations which may appear shall have the meanings indicated herein.

### 1.2 GENERAL ABBREVIATIONS

Common abbreviations that may be found in the Contract Documents include, but are not limited to, the following:

| | | | |
|---|---|---|---|
| acrylonitrile butadiene styrene | ABS | alternating current | a-c, AC |
| American wire gauge | AWG | ampere | A |
| average | avg | brake horsepower | bhp |
| British thermal unit | Btu | Centigrade (or Celsius) | C |
| centipoise | cp | chlorinated polyvinyl chloride | CPVC |
| cleanout | CO | company | Co |
| cubic feet per minute | cfm | cubic feet per second | cfs |
| cubic foot | cu ft | cubic inch | cu in |
| cubic yard | cu yd | decibel | db |
| decibels, A-weighted | dBA | degree Centigrade (or Celsius) | ˚C |
| degree Fahrenheit | ˚F | diameter | dia |
| direct current | dc | dollars | $ |
| ductile iron | DI | each | ea |
| efficiency | eff | elevation | El |
| ethylene propylene rubber | EPDM | Fahrenheit | F |
| feet | ft | feet per hour | fph |
| feet per minute | fpm | feet per second | fps |
| fiberglass reinforced plastic | FRP | figure | Fig |
| flange | flg | foot-pound | ft-lb |
| gallons (U.S.) | gal | gallons (U.S.) per hour | gph |
| gallons (U.S.) per minute | gpm | gallons (U.S.) per second | gps |

| | | | |
|---|---|---|---|
| gallons (U.S.) per square foot day | gfd | galvanized | galv |
| gauge | ga | hand/off/automatic | HOA |
| Hertz | Hz | horsepower | hp |
| hour | hr | inch | in |
| inch-pound | in-lb | input/output | I/O |
| instrumentation and control | I&C | kilovolt | KV |
| kilovolt-ampere | kva | kilowatt | kw |
| kilowatt-hour | kw-hr | length | l |
| length to least radius of gyration | l/r | light emitting diode | LED |
| linear | lin | linear foot | LF |
| liter | L | liter per hour square meter | L/hr-$m^2$ |
| maximum | max | mercury | Hg |
| Membrane System Supplier | M | Microfiltration | MF |
| micron | µm | milli-amp | mA or ma |
| milliampere DC | mADC | milligram | mg |
| milligrams per liter | mg/L | milliliter | mL |
| millimeter | mm | million gallons (U.S.) | MG |
| million gallons per day (U.S.) | mgd | minimum | min |
| motor control center | MCC | National Pipe Threads | NPT |
| nephelometric turbidity units | ntu | net positive suction head available | NPSHA |
| net positive suction head required | NPSHR | Operation and Maintenance | O&M |
| ounce | oz | outside diameter | OD |
| parts per million | ppm | Permeability | 1/R |
| polytetrafluoroethylene | PTFE | polyvinyl chloride | PVC |
| pound | lb | pounds per square foot | psf |
| pounds per square inch | psi | pounds per square inch absolute | psia |
| pounds per square inch differential | psid | pounds per square inch gage | psig |
| Process and Instrumentation Diagrams | P&ID | random access memory | RAM |
| resistance | R | revolutions per minute | rpm |
| Silt Density Index | SDI | specific gravity | sp gr |

| | | | |
|---|---|---|---|
| square foot | sq ft | square inch | sq in |
| square yard | sq yd | stainless steel | SS |
| standard | std | standard cubic feet per minute | scfm |
| total dynamic head | TDH | totally-enclosed, fan-cooled | TEFC |
| totally-enclosed, non ventilated | TENV | twisted shielded | TWSH |
| variable frequency drive | VFD | volt | V |
| volts alternating current | VAC | volts direct current | VDC |
| water column | WC | | |

## 1.3 INSTITUTIONAL ABBREVIATIONS

Abbreviations of institutions or organizations that may be used in the Contract Documents include, but are not limited to, the following:

| | |
|---|---|
| ABMA | American Bearing Manufacturers Association |
| AFBMA | Anti-Friction Bearing Manufacturers Association |
| AGA | American Gas Association |
| AGMA | American Gear Manufacturers Association |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| AMPP | Association for Materials Protection and Performance |
| ANSI | American National Standards Institute, Inc. |
| APWA | American Public Works Association |
| ASCE | American Society of Civil Engineers |
| ASTM | American Society for Testing and Materials |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| CSA | Canadian Standards Association |
| EI | Energy Institute |
| EJCDC | Engineers Joint Contract Documents Committee |
| EPA | Environmental Protection Agency |
| HI | Hydraulic Institute |
| IBC | International Building Code |
| IECC | International Energy Conservation Code |
| IEEE | Institute of Electrical and Electronics Engineers |
| IFC | International Fire Code |
| IFGC | International Fuel Gas Code |
| ISA | Instrument Society of America |
| ISO | Insurance Services Office |
| MSS | Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. |
| NAAMM | National Association of Architectural Metal Manufacturers |
| NBS | National Bureau of Standards |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturers Association |
| NESC | National Electrical Safety Code |
| NSF | National Sanitation Foundation |
| OSHA | Occupational Safety and Health Administration |

| | |
|---|---|
| SAE | Society of Automotive Engineers |
| SPI | Society of the Plastics Industry, Inc. |
| SSPC | Steel Structures Painting Council |
| SSPWC | Standard Specifications for Public Works Construction |
| TEMA | Tubular Exchange Manufacturers Association |
| IBC | International Building Code |
| IFC | International Fire Code |
| UL | Underwriters Laboratories, Inc. |
| USEPA | United States Environmental Protection Agency |
| WEF | Water Environment Federation |

1.4 Symbols

A. Refer to Drawings for symbols used on drawings.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 33 17 – STRUCTURAL DESIGN, SUPPORT AND ATTACHMENT

## PART 1 -- GENERAL

1.01 SUMMARY

A. The Seller shall provide calculations and details for structural and non-structural components, supports, and anchorages as required by the Contract Documents and the 2022 Oregon Structural Specialty Code (OSSC). The Shall shall furnish all such structural and non-structural components, supports, attachments, and anchorages in accordance with the calculations and details for installation by Contractor.

B. Where a conflict exists between the requirements of the Contract Documents and the OSSC, the more stringent requirement shall apply.

C. Design parameters used to determine Seismic and Wind design forces shall be as listed herein.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Reference Specifications:

1. Section 01 34 00, Shop Drawing Procedures

B. The edition of the standards applicable to the Work shall be those editions referenced by the 2022 OSSC. If the standard is not referenced by the OSSC-referenced standard listed below, the edition of the standard applicable to the Work shall be the edition in effect on the date of signing and sealing of the contract specifications.

| | |
|---|---|
| OSSC | 2022 Oregon Structural Specialty Code |
| **American Society of Civil Engineers (ASCE)** | |
| ASCE 7 -16 | Minimum Design Loads and Associated Criteria for Buildings and Other Structures. |
| **American Concrete Institute (ACI)** | |
| ACI 318 | Building Code Requirements for Structural Concrete (2014 edition) |

1.03 SUBMITTALS

A. Furnish submittals in accordance with Section 01 34 00, Shop Drawing Procedures..

1. Calculations and Details

2. Calculations and details are considered a Deferred Submittal as defined in the OSSC.

3. Calculations and details shall be complete, accurate, and in accordance with the requirements of the OSSC and ASCE 7 and shall be signed and sealed by a Professional Engineer registered in the State of Oregon.

4. Calculations shall be clear and concise and show equipment and other non-structural component anchorage forces and the capacities of the anchorage

elements proposed by the Seller. The calculations shall substantiate a complete load path from the component or equipment being anchored into the supporting structure or foundation.

5. The calculations and details shall demonstrate a complete lateral and vertical load path and shall clearly indicate all forces imposed on the supporting structure.

6. Calculations and details are required for all Non-Structural components, supports, anchorages, and attachments.

    a. Non-Structural components shall include all architectural, mechanical, and electrical components, equipment, piping, ductwork, and all other similar or related appurtenances necessary to produce the complete architectural, mechanical, and electrical systems.

7. When the Contract Documents require the Seller to design structures or structural components, calculations and details for those structures and structural components, and their supports, anchorages, and attachments, are required.

8. When computer generated calculations and analyses are included as part (or as the whole) of the calculations, the calculations shall include, but not be limited to, the following: derivations of all input parameters; clear indication of the applicable load combinations and building code equations; diagrams of all members, geometry, loads, forces, reactions and deflections, for all components and connections; and output results demonstrating all stress, force, deflection and other Contract Document and building code requirements have been satisfied.

9. All calculations associated with anchorage into concrete or masonry shall be done using Strength Level forces and shall be in accordance with the applicable provisions of ACI 318.

10. Refer to Part 2 below for additional requirements.

**PART 2 -- PRODUCTS**

2.01 GENERAL

A. Non-Structural Component Supports and Anchors

1. Unless otherwise indicated, non-structural component supports, anchors, and restrainers shall be adequately designed for all applicable static, dynamic, operational, seismic and wind loads.

    a. Wall-mounted equipment weighing more than 250 pounds or which is within 18-inches of the floor shall be provided with fabricated steel supports. Pedestals shall be of welded steel or engineered framing support systems. If the supported equipment is a panel or cabinet or is enclosed with removable sides, the pedestal shall match the supported equipment in appearance and dimensions.

b. All equipment and all other non-structural components shall be supported and anchored in place by methods that satisfy the building code and the Contract Documents.

c. All equipment and all other non-structural components shall be supported and anchored in place by methods that satisfy the manufacturer's applicable seismic certification requirements.

2. Component attachments shall be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.

B. Non-Building Structures

1. Non-Building Structures shall be designed in accordance with ASCE 7 Chapter 15.

2. Non-Building Structures, foundations, supports, anchors, and restrainers shall be adequately designed for all applicable static, dynamic, operational, seismic and wind loads.

C. Anchors – General

1. Anchor bolts shall be cast-in-place unless otherwise noted or approved by the Engineer.

2. The Contractor shall determine the size, type, capacity, location, and other placement requirements of anchorage elements. Anchoring methods and leveling criteria in the manufacturer's literature shall be followed. Submit methods and criteria with the calculations and details.

3. Anchor bolt calculations shall clearly show that the capacity of the anchor and the capacity of the concrete that the anchor is embedded in are adequate to resist all applicable load combinations, including seismic and wind loads.

a. The design of anchors resisting seismic forces shall satisfy the ductility requirements stated in the IBC, ASCE 7, ACI 318.

4. Reduction factors associated with edge distance, embed length, grout and base plate thickness, and bolt spacing shall all be considered and based on the actual dimensions of the concrete or masonry that resists the anchorage forces.

5. Where anchorage is required into or through equipment pads, the following requirements shall apply unless otherwise approved by the Engineer:

a. For tensile forces, the embed length and associated concrete failure zone shall be provided entirely within the structural slab. No portion of the equipment pad may be considered as effective in resisting tensile forces.

b. For shear forces, the edge distance and associated concrete failure zone shall be provided entirely within the equipment pad. No portion of the structural slab may be considered as effective in resisting shear forces.

6. Anchor bolt details shall include required bolt diameter, embed, spacing, and edge distances.

7. Where additional reinforcement is required to satisfy anchorage requirements, such reinforcement shall be included in the anchorage details, and shall be furnished and installed by the Contractor.

D. Mechanical and Electrical Equipment Foundations

1. The Seller, through the equipment manufacturer, shall verify the size and weight of the equipment foundation to ensure compatibility with equipment.

2. Equipment foundation dimensions shall be coordinated with the equipment base geometry and the edge distance and embed requirements of the equipment anchorage calculations.

E. Mechanical and Electrical Equipment (Housekeeping) Pads

1. General

a. Equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on concrete equipment pads, unless otherwise indicated. The top surface of the equipment pads shall be level, unless otherwise indicated, or otherwise required by the equipment manufacturer.

b. Equipment pads shall be sized to accommodate the bearing and anchorage requirements of the equipment, subject to the constraints listed below.

c. Final geometry of the equipment pads shall not result in a condition that violates applicable building code provisions, including but not limited to the provisions of the National Electric Code.

2. Mechanical Equipment Pads

a. Mechanical equipment pad heights shall be coordinated with process equipment and piping elevation requirements. Where no such elevation constraints exist, the equipment pad height shall be as shown on the drawings, or as indicated below when no specific height is provided.

1) Equipment pads for mechanical equipment shall be 3.5 inches tall (maximum) at the front of the equipment.

b. Mechanical equipment pads shall extend not more than 2 inches beyond the front, back, and sides of the equipment, except as indicated below, unless otherwise shown on the drawings.

1) Where necessary to meet seismic or wind anchorage requirements, the pads may be extended beyond the 2 inch limit indicated above. The pads shall extend not more than 6 inches beyond the front, back, and sides of the equipment.

3. Electrical Equipment Pads

a. Electrical equipment pads shall be 3.5 inches tall (maximum) at the front of the equipment.

b. Electrical equipment pads shall extend not more than 2 inches beyond the front, back, and sides of the equipment, except as indicated below, unless otherwise shown on the drawings.

c. Where necessary to meet seismic anchorage requirements, the pads may be extended beyond the 2 inch limit indicated above. The pads shall extend not more than 6 inches beyond the front, back, and sides of the equipment.

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 34 00 SHOP DRAWING PROCEDURES

## PART 1 -- GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. This Section specifies the methods and requirements for submittals including Shop Drawings and Product Data. Additional requirements are contained in Article 5 of the General Conditions. Specific requirements for Shop Drawings are denoted in the applicable Sections.

B. Submittal for each Section shall be provided with a separate transmittal form. Submittals shall be completed and organized by the Section noted in the table at the end of this Section. Each submittal shall be clearly identified by reference to applicable Section Number. Submittals shall clearly reference the Contract Number and bear the identification of the Seller. Submittals shall be clear and legible and of sufficient size for presentation of data. Each submittal shall be signed by the Seller.

C. Failure to provide the Shop Drawings as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Engineering Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until acceptable Shop Drawings have been provided.

D. Reference Specifications

1. Section 11 30 00, Hollow Fiber Membrane Equipment

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings as specified in individual Sections include, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the work.

2. All shop drawings submitted by subcontractors or component equipment suppliers shall be sent directly to the Seller for checking. The Seller shall be responsible for coordination and checking their submittals before submitting to the Engineer for review and approval.

3. The Shop drawing submittal shall identify a single manufacturer or provider of component equipment. Shop Drawings that identify multiple suppliers for the same item will be rejected.

4. The Seller shall check all subcontractors or component equipment suppliers shop drawings regarding measurements, size of members, materials of construction and fabrication details to make sure that they conform to the Drawings and Specifications.

5. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

6. For all tagged devices supplied, the Seller shall develop an “Equipment Cross Reference Schedule” per Section 01 08 00, Identification and Tagging, that matches the Tag to the appropriate equipment manual. The Cross Reference Schedule shall be provided for each section submitted.

    a. The equipment schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range. The Equipment Cross- Reference Schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

    b. Provide a separate listing for all Membrane Unit Equipment, including cross-reference schedules with the Membrane Unit (Section 11 30 00, Hollow Fiber Membrane Equipment) submittal. Equipment that is not considered part of the Membrane Unit shall be submitted with the appropriate division submittal.

7. Drawings: Provide in PDF format with bookmarks.

8. Standard product data shall be clearly identified with reproducible arrows or other marking indicating the parts to be supplied with the equipment. Any parts or equipment not provided shall be marked out. In the event that an individual product data sheet has multiple items selected, refer to the Equipment Cross Reverence Schedule, to obtain the relevant model and part number.

B. Product Data

1. Product data as specified in individual Sections include, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare- parts listing and printed product warranties, as applicable to the work.

C. Samples

1. Samples specified in individual Sections include, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Buyer for independent inspection and testing, as applicable to the work.

1.03 SELLER'S RESPONSIBILITIES

A. Review shop drawings, product data and samples, including those by component equipment suppliers and subcontractors, prior to submission to determine and verify the following:

1. Measurements

2. Construction criteria

3. Catalog numbers and similar data

4. Conformance with related Sections

B. Each shop drawing, sample and product data submitted by the Seller shall have affixed to it the following Certification Statement including the Seller's Company name and signed by the Seller designated Project Manager. Shop drawings and product data sheets shall be organized using bookmarks in PDF format and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package.

C. A separate transmittal form shall be used for each section where submittal is required. Transmittal of Shop Drawings on various items using a single transmittal form shall be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole.

D. The Seller shall utilize a 9-character submittal identification numbering system in the following manner:

Clarification: custom labeling is not included due to time constraints. An example of tagging is in Appendix L

1. The first six digits shall be the applicable Section Number.

2. The next two digits shall be the numbers 01 to 99 to sequentially number each initial separate item or drawing submitted under each specific Section Number.

3. The last character shall be a letter, A to Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

11 30 00-01-B

11 30 00 = Section for hollow fiber membrane equipment

01 = The eighth submittal under this section

B = The second submission (first resubmission) of that particular shop drawing.

4. Once information for a section has been prepared to completion, it may be submitted to the Engineer for review. However, if the Engineer determines that the review and approval of the section is contingent upon receipt of additional submittal information, the review of that section shall not be performed until all information has been received.

E. Notify the Buyer and Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

F. The review and approval of shop drawings, samples or product data by the Buyer and Engineer shall not relieve the Seller from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Seller and the Buyer and Engineer will have no responsibility therefor. The Buyer and the Engineer may review the conformance of all Goods and Special Services with respect to the Contract Documents at any time prior to Final Acceptance.

G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.04 SUBMITTAL REQUIREMENTS

A. Make submittals promptly in accordance with the Contract Times specified in Article 5 of the General Conditions.

B. Schedule and Coordination Meetings

1. The Seller shall submit Shop Drawings Table A and Table B of this Section.

2. Within 10 days after the issuance of the First Shop Drawing the Seller shall meet with the Engineer and Buyer at the Buyers location to review and receive comment regarding the Shop Drawing Submittal.

3. Within 10 days after the issuance of the Second Shop Drawing Submittal, the Seller shall meet with the Engineer and Buyer at the Buyers location to review and receive comment regarding the Shop Drawing Submittal.

C. Each submittal, appropriately coded, will be returned within 15 working days following receipt of submittal by the Engineer.

D. Number of submittals required:

1. Shop Drawings: 1 electronic copy in PDF format.

2. Samples: Submit the number stated in the respective Sections.

3. Drawings: 1 electronic copy in PDF format.

E. A letter of transmittal shall accompany each submittal.

F. At the beginning of each letter of transmittal, provide a reference heading indicating the following:

| | |
|---|---|
| Buyer's Name | City of Sandy |
| Project Name | Sandy Program Management |
| Contract No. | Alder Creek WTP |
| Transmittal No. | |
| Section No. | |

G. All Shop Drawings submitted shall bear the stamp of approval and signature of the Seller as evidence that they have been reviewed by the Seller. Submittals without this stamp of approval will not be reviewed by the Buyer and will be returned to the Seller. The Seller's stamp shall contain the following information:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Seller identification.

4. Name of the following:

   a. Seller

   b. Supplier, Distributor or Manufacturers Representative

   c. Manufacturer (i.e. Component Equipment Manufacturer)

5. Identification of the product, with the section number, page, and paragraph(s), drawing number.

6. Identification of deviations from Contract Documents.

7. Identification of revisions on resubmittals.

8. A blank 3-inch x 4- inch space for Engineers review stamp.

9. Where calculations are required to be submitted by the Seller, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

H. All Shop Drawings submitted for approval shall have a title block with complete identifying information satisfactory to the Buyer

1.05 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

A. Refer to Article 5.06 of the General Conditions.

B. One marked up electronic PDF format copy will be returned to the Seller under one of the following notations.

1. "NO EXCEPTIONS TAKEN" is assigned when there are no notations or comments on the submittal. When returned under this code the Seller may release the equipment and/or material for manufacture, unless specifically noted in the Agreement or the General Conditions.

2. "MAKE CORRECTIONS NOTED". This code is assigned when a confirmation of the notations and comments IS NOT required by the Seller. The Seller may release the equipment or material for manufacture unless specifically noted in the Agreement or the General Conditions; however, all notations and comments must be incorporated into the final product without exception.

3. "MAKE CORRECTIONS NOTED/CONFIRM". This combination of codes is assigned when a confirmation of the notations and comments IS required by the Seller. The Seller may, at his own risk, release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Buyer and Engineer within 15 working days of the date of the Engineer's transmittal requiring the confirmation.

4. "AMEND - RESUBMIT". This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non- conforming items that were noted. Resubmittal is to be received by the Buyer and Engineer within 15 working days of the date of the Engineer's transmittal requiring the resubmittal.

5. "REJECTED - RESUBMIT" is assigned when the submittal does not meet the intent of the Contract Documents. The Seller must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.

6. "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the Seller.

7. Items 1 through 5 designate the status of the reviewed submittal with Item 6 showing there has been an attachment of additional data.

C. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Seller shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittial shall clearly respond to each comment made by the Buyer and Engineer on the previous submission. Additionally, the Seller shall direct specific attention to any revisions made other than the corrections requested by the Buyer and Engineer on previous submissions.

D. Partial submittals may not be reviewed. The Buyer and Engineer will be the sole judge as to the completeness of a submittal. Submittals not complete will be returned to the Seller and will be considered "Rejected" until resubmitted. The Buyer and Engineer may at his option provide a list or mark the submittal directing the Seller to the areas that are incomplete.

E. If the Seller considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Seller shall give written notice thereof to the Buyer and Engineer at least 7 working days prior to release for manufacture.

F. When the shop drawings have been completed to the satisfaction of the Buyer and Engineer, the Seller shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Buyer and Engineer.

G. All Shop Drawings and Samples shall be submitted prior to the dates established in Article 5 of the Agreement. For any Shop Drawing that is submitted after the dates established in Article 5 of the Agreement, if the Shop Drawing is deemed

H. “AMEND - RESUBMIT” or “REJECTED” the Buyer shall notify the Seller within five working days after receipt of the Shop Drawings that the shop drawings furnished were not acceptable. Upon notification, the Seller has ten working days to produce and deliver to the Buyer an acceptable Shop Drawing(s).

I. In the event that the Seller requests an “or equal” for a previously approved item, all of the Engineer’s costs in the reviewing and approval of the “or equal” will be back-charged to the Seller, unless the need for such “or-equal” is beyond the Seller’s control.

1.06 DISTRIBUTION

A. In accordance with the requirements of Section 01 73 00, Installation, Operation and Maintenance Manuals, distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Buyer and Engineer. Number of copies shall be as directed by the Buyer and Engineer.

1.07 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

1.08 GENERAL PROCEDURES FOR SUBMITTALS

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Seller’s failure to transmit submittals in a timely manner.

B. Submit Shop Drawings to the Engineer(s) at the addresses indicated below:

Stantec Consulting Services, Inc.
c/o Adam Odell, P.E.
Tel:(503) 220-5409
Adam.Odell@stantec.com

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

**PART 4 -- SUPPLEMENTAL INFORMATION**

## FIRST SHOP DRAWING SUBMITTALS -- TABLE A

| SECTION | TITLE | PARAGRAPH | DATE SUBMITTED | DATE APPROVED |
|---|---|---|---|---|
| 01 74 00 | Membrane System and Module Warranty | 1.03A | | |
| ~~09 90 00~~ | ~~Painting~~System P&IDs | 1.03A | | |
| 11 30 00 | General Arrangement Drawings | 1.03A | | |
| 11 30 00 | Electrical One-line drawings | 1.03A | | |
| 11 30 00 | Valve, instrument, and equipment lists [Addendum #5] | 1.03A | | |
| ~~11 21 10~~ | ~~Horizontal End Suction Pumps~~ | 1.03A | | |
| ~~11 24 90~~ | ~~Fiberglass Reinforced Plastic Tank~~ | 1.03.A.1 | | |
| ~~11 30 00~~ | ~~Hollow Fiber Membrane Equipment~~ | 1.03A.2.a | | |
| ~~11 34 00~~ | ~~Automatic Self-Cleaning Strainers~~ | 1.03A | | |
| ~~11 37 00~~ | ~~Compressed Air System~~ | 1.03A | | |
| ~~11 37 10~~ | ~~Blower Positive Displacement~~ | 1.03A | | |
| ~~11 39 10~~ | ~~Diaphragm Pumps~~ | 1.03A | | |
| ~~11 39 50~~ | ~~Vertical Inline Centrifugal Booster Pumps~~ | 1.03A | | |
| ~~11 40 05~~ | ~~Strainers~~ | 1.03A | | |
| ~~13 32 70~~ | ~~Process Instrumentation General Requirements and Switches~~ | 1.03A | | |
| ~~13 32 80~~ | ~~Process Instrumentation Meters and Transmitters~~ | 1.03A | | |
| ~~13 32 90~~ | ~~Process Instrumentation Analyzers~~ | 1.03A | | |
| ~~15 10 00~~ | ~~Ball Valves~~ | 1.03A | | |
| ~~15 10 10~~ | ~~Butterfly Valves~~ | 1.03A | | |
| ~~15 10 40~~ | ~~Check Valves~~ | 1.03A | | |
| ~~15 10 50~~ | ~~Specialty Valves~~ | 1.03A | | |
| ~~15 10 60~~ | ~~Valve Actuators~~ | 1.03A | | |
| ~~16 48 20~~ | ~~Variable Frequency Drive Units~~ | 1.03A | | |

## SECOND SHOP DRAWING SUBMITTALS -- TABLE B

| SECTION | TITLE | PARAGRAPH | DATE SUBMITTED | DATE APPROVED |
|---|---|---|---|---|
| ~~01 08 00~~ | ~~Identification and Tagging~~ | ~~1.03A~~ | | |
| ~~01 75 00~~ | ~~Spare Parts~~ | ~~1.03A~~ | | |
| ~~05 05 19~~ | ~~Post-Installed Concrete Anchors~~ | ~~1.03A~~ | | |
| ~~11 24 90~~ | ~~Fiberglass Reinforced Plastic Tanks~~ | ~~1.03A.2~~ | | |
| ~~11 30 00~~ | ~~Hollow Fiber Membrane Equipment~~ | ~~1.03A.2.b~~ | | |
| ~~13 32 00~~ | ~~Instrumentation and Control System Functional Description~~ | ~~1.03A~~ | | |
| ~~13 32 10~~ | ~~Instrumentation and Control System General Requirements~~ | ~~1.03A~~ | | |
| ~~13 32 50~~ | ~~Programmable Logic Control Equipment~~ | ~~1.03A~~ | | |
| ~~13 32 60~~ | ~~SCADA System~~ | ~~1.03A~~ | | |
| ~~13 33 00~~ | ~~Control Panels, Enclosures, and Panel Instruments~~ | ~~1.03A~~ | | |
| ~~15 06 20~~ | ~~Stainless Steel Pipe and Tubing~~ | ~~1.03A~~ | | |
| ~~15 07 00~~ | ~~PVC and CPVC Piping Systems~~ | ~~1.03A~~ | | |
| ~~15 07 10~~ | ~~HDPE Piping Systems~~ | ~~1.03A~~ | | |
| ~~16 15 00~~ | ~~Manufactured Wiring Systems~~ | ~~1.03A~~ | | |
| 11 30 00 | Catalog cut sheets for all tagged equipment [Addendum #5] | 1.03A | | |
| 11 30 00 | Spare Parts List | 1.03A | | |
| 11 30 00 | Tank Drawings | 1.03A | | |
| 11 30 00 | SFD | 1.03A | | |
| 11 30 00 | Control Panel Drawings | 1.03A | | |

# P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the [State] [Commonwealth] of _____ and that he/she has been employed by

_____ to design
(Name of Seller)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the

_____.
(Name of Project)

The undersigned further certifies that he/she has performed the design of the _____, that said design is in conformance with all
(Name of Project)

applicable local, state, and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the

_____
(Insert Name of Buyer)

or Buyer's representative within seven days following written request therefor by the Buyer.

| | |
|---|---|
| _____ | _____ |
| P.E. Name | Seller's Name |
| _____ | _____ |
| Signature | Signature |
| _____ | _____ |
| Address | Title |
| | _____ |
| | Address |

END OF SECTION

# SECTION 01 61 00 TRANSPORTATION AND HANDLING OF GOODS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. The Seller shall make all arrangements for transportation and delivery of equipment and materials to the Point of Destination.

2. Shipments of materials shall be delivered to the Point of Destination only during regular working hours. Shipments shall be addressed, and delivered to the Contractor, except where otherwise directed.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) - (NOT USED)

1.03 SUBMITTALS

A. Shipping List

1. Prior to the delivery of the Goods, the Seller shall develop and submit to the Contractor a Bill of Materials for the contents of all shipments. This list shall detail contents, size, weights and tag numbers of each item shipped. Upon receipt of the Goods, the Bill of Materials shall be used to determine that the Goods have been received by the Contractor in accordance with Article 5 of the General Conditions.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. The Seller shall arrange deliveries of products in accordance with the Contract Time requirements stipulated in the Agreement.

B. The Seller shall coordinate deliveries that occur between specified Contract Times to accommodate the following:

1. Work of other Contractors or Buyer

2. Limitations of storage space

3. Availability of equipment and personnel for handling products

C. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment to simplify accumulation of parts and facilitate assembly.

D. Each part within a shipment shall be clearly labeled with the reference numbers and tag numbers included in the Bill of Materials.

E. Upon delivery, the Seller and Contractor, shall inspect shipment(s) to ensure:

1. Product complies with requirements of approved submittals

2. Containers and packages are intact

3. Labels are legible

4. Products are properly protected and undamaged

F. The Contractor will provide equipment and personnel necessary to handle products by methods designed to prevent soiling or damage.

G. The Contractor will provide storage facilities in accordance with the Seller storage requirements to be submitted prior to delivery and along with the delivered equipment under Section 01 61 10, Protection of Goods.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 61 10 PROTECTION OF GOODS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. The Seller shall protect Goods in accordance with manufacturer's recommendations and the requirements of the Contract Documents.

2. The Seller shall make all arrangements and provisions necessary for the protection of Goods during delivery to the Point of Destination.

3. Manufacturer's containers may be opened for inspection and verification of the Goods in accordance with Article 8 of the General Conditions. Upon completion of inspection, the Goods shall be repackaged and remain unopened until the time of installation, unless recommended by the manufacturer or otherwise specified.

4. The Seller shall provide the Buyer and the Contractor with a list of Goods that are to be delivered prior to shipment.

B. Reference Specifications - Not Used

C. Coordination: The Seller shall coordinate with the Buyer and Contractor for Goods that require special protection, storage or handling

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC) — NOT USED

1.03 SUBMITTALS

A. Provide submittals required by this section, at least 30 days prior to delivery of the Goods.

B. The Seller shall provide the Contractor with a, list of pumps, motors, drives, electrical, equipment, instrumentation equipment (controls, devices, panels, etc.), and other equipment having anti-friction or sleeve bearings for storage in weather tight storage facilities, such as warehouses.

C. The Seller shall provide the Contractor with a list of all panels, microprocessor-based equipment, and all other Goods and devices subject to damage or useful life decrease due to:

1. Temperatures below 40˚F or above 120˚F

2. Relative humidity above 90 percent

3. Or exposure to rain

D. Fully Protected Storage

1. The Seller shall provide the Contractor with a list. of Goods which could be damaged by low or high temperature and require temperature-controlled storage space.

2. The Seller shall provide the Contractor a list of Goods that require protection from contamination by dust, dirt, and moisture.

3. The Seller shall provide the Contractor with a list of Goods that require storage at specific humidity levels as recommended by manufacturer.

E. Seller Storage and Handling Instructions

1. The Seller shall provide specific storage and handling instruction for each loose-shipped item of equipment, instrumentation, materials and crates provided by the Seller.

2. The Seller shall identify requirements for storage and handling of the membrane modules.

3. The Seller shall identify the solution used for storage of the membrane modules.

1.04 PRODUCT STORAGE AND HANDLING

A. Goods shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. Each container shall be clearly marked with the Seller's name, project name, and location. Goods shall be protected from exposure to the elements and shall be kept thoroughly dry at all times.

B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged prior to acceptance shall be repainted.

1. All parts shall be protectively wrapped and/or packaged, using materials commensurate with the weight and configuration of the part, the method of handling, and the method of transportation.

2. Contact or pressure points shall be sufficiently protected when using steel or J elastic banding.

3. Cabinets and equipment too heavy to be handled or transported by one man shall be adapted for handling with pallet trucks and/or forklifts.

4. Painted surfaces which will come in contact with lifting forks or other handling equipment (such as the bottom of cabinets or skid base frame, members) shall be sufficiently padded with heavy corrugated cardboard, foam or other protective materials.

5. Small equipment and skids shall be mounted on wooden pallets designed for fork lifting. This equipment shall be bolted (using existing holes in the frame) or strapped to the pallet to prevent tipping. Equipment and skids too large to be mounted on pallets shall have wooden block damage bolted or strapped to the base foundation pads to prevent paint degradation during handling, assembly and installation.

C. Electrical equipment, controls, and instrumentation shall be protected against moisture or water damage. Space heaters provided in the equipment will be connected by the Contractor as noted by the Seller and operated at all times until equipment is placed in operation.

D. Containerized Membrane Filtration Units shall be delivered to the site as assembled units to the fullest degree possible.

E. Notice of Enclosed Instructions: All delivered packages containing Goods shall have notices clearly visible on the exterior of the package indicating that maintenance instructions are enclosed.

F. Panel and Instrumentation Storage: All packages containing panels; electronic devices, and other microprocessor-based equipment shall contain a desiccant, volatile corrosion inhibitor (VCI) blocks, a moisture indicator, and maximum-minimum indicating thermometer. The Seller shall provide a spare set of such protection equipment including a desiccant, a moisture indicator, and VCI blocks for each package containing panels, electronic devices, and other microprocessor-based equipment for replacement by the Contractor during the storage period.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 62 00 INSTALLATION OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Seller shall coordinate all services and activities required by this section with the Buyer, Contractor and the Engineer.

1. Upon completion of installation, the Engineer shall issue a “Notice of Completed Installation”.

B. Reference Specifications:

1. Section 01 61 00 Transportation and Handling of Goods
2. Section 01 61 10 Protection of Goods
3. Section 01 66 00 Commissioning of Membrane Equipment
4. Section 01 73 00 Installation, Operation and Maintenance Manuals
5. Division 11 Equipment

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. Pre-Delivery Submittals

1. In accordance with Section 01 61 00, Transportation and Handling of Goods, the Seller shall provide to the Contractor a listing of Goods to be transported to the Point of Destination.
2. In accordance with Section 01 61 10, Protection of Goods, the Seller shall provide to the Contractor a listing of Goods that require protection. Special storage, protection, and handling instructions shall be provided for these items.
3. In accordance with Section 01 73 00, Installation, Operation and Maintenance Manuals shall be provided.

## PART 2 -- PRODUCTS – (NOT USED)

## PART 3 -- EXECUTION

3.01 INSTALLATION

A. The Seller shall provide training to the Contractor for installation of membrane equipment. The training shall be conducted on-site by an authorized, experienced, employee of the Seller.

B. An employee of the Seller shall be present on-site to oversee the proper placement and installation of at least one (1) Seller units and ancillary equipment supplied by the Seller including but not limited to tanks, pumps, and control panels.

C. This representative of the Seller shall also be present to oversee the assembly installation of the associated anchor bolts for Seller-furnished equipment.

D. Seller shall be responsible for identification of the volume and concentration of the membrane module storage solution and rinsing requirements for the membrane modules.

E. Contractor shall be responsible for making adjustments and/or modifications to the installation process that may become necessary to ensure that the equipment is properly installed.

F. After the installation is complete, the Seller, Contractor, and Engineer shall jointly perform a pre-commissioning inspection of the containerized membrane system. The inspection shall identify the following:

1. Mechanical

    a. Containerized Membrane units shall be completely installed and unit and interconnecting piping pressure tested.

    b. The Process Air System piping supplying pressurized air from the containerized membrane units to the neutralization system shall be completely installed and the piping pressure tested.

2. Electrical

    a. All local control panels shall be installed and terminations completed.

    b. All 480V, 120V, and 24VDC power supplies shall be connected and verified.

    c. The documentation associated with the inspection of electrical terminations shall be provided by the Contractor to the Seller.

G. Contractor shall be responsible for making adjustments and/or modifications to the installation process that may become necessary to ensure that all equipment is properly installed.

1. The inspection shall identify equipment that has not been properly installed, detailing the outstanding installation issues on a “punch list”, and noting the party who shall be responsible for each correction and identify the items that require correction before commissioning can begin.

2. Once the corrections identified have been made, a “Notice of Completed Installation” shall be issued by the Engineer and commissioning shall commence in accordance with the requirements of Section 01 66 00, Commissioning of Membrane Equipment.

# SECTION 01 66 00 COMMISSIONING OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work: The Seller shall commission the membrane equipment and place the system into operation. Commissioning is subject to the following provisions:

1. Commissioning shall not commence until the “Notice of Completed Installation” is issued in accordance with Section 01 62 00, Installation of Membrane Equipment.

2. Commissioning shall be completed by the Seller within the allocated time as identified in the Agreement.

3. The Engineer shall document the time when the facilities are substantially unavailable for use by the Seller to perform commissioning. Potential times of substantial unavailability include: 1) when the installation of membrane modules results in a delay to the Seller, 2) when the Engineer conducts its review of system operation and 3) circumstances beyond the control of the Seller including but not limited to power outages, lack of feedwater, inability to transfer product water or feedwater due to factors beyond the control of the Seller, not having adequate staff from the Contractor or the Buyer. If in the sole opinion of the Engineer the facilities are substantially unavailable to the Seller, equivalent additional commissioning time will be granted.

4. Failure to complete the Commissioning as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until commissioning is complete.

5. Upon completion of Commissioning, the Engineer shall issue the “Notice of Completed Commissioning.”

B. The Seller shall coordinate all services and activities required by this Section with the Contractor, the Engineer and the Buyer. These activities shall be coordinated with the requirements of Section 13 32 30, Instrumentation and Control System Commissioning.

C. The Seller shall perform all other tests required by the Specifications.

D. Reference Specifications:

1. Section 01 73 10, Training of Operations and Maintenance Personnel

2. Section 11 30 00, Hollow Fiber Membrane Equipment

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. The Seller shall prepare a “Detailed Plan of Commissioning Activities” that will be used as a guideline for Commissioning of the Goods provided by the Seller. The Detailed Plan of Commissioning Activities shall be used to coordinate the activities of the Seller’s personnel. The “Detailed Plan of Commissioning Activities” will identify the Commissioning requirements for all Goods supplied by the Seller. The guidelines shall include the following minimum check items.

1. Pump(s), Metering Pumps, Blowers, Compressors and Other Rotating Equipment

    a. Filled with Oil

    b. Rotation is Proper

    c. Aligned Properly (Mechanical Seal has been set)

    d. Receives and responds to Process Control Command Signals (Discrete and/or Analog)

2. Instruments (Flow, Pressure, Level, Temperature and Analytical)

    a. Electrical Supply is Connected

    b. Software is Configured

    c. Responds to Position and Sends Discrete and Analog Signals

    d. Control Alarm Set Point has been established

    e. Instrument is calibrated

3. Switches (Flow, Pressure, Level and Temperature)

    a. Electrical Supply is Connected

    b. Sends Signal Upon Transition of State

    c. Are Calibrated

4. Automated Modulating Valves

    a. Air and/or Electrical Supply is Connected

    b. Responds to Position and Sends Feedback Signals

    c. Control Alarm Set Point has been established

5. Manual and Automatic Valves

    a. Air and/or Electrical Supply is Connected

b. Responds to and sends Feedback (Limit Switch) Signals

B. The “Detailed Plan of Commissioning Activities” will be used as a guideline for placing the facility into operation. The “Detailed Plan of Commissioning Activities” shall be coordinated with the activities of the Contractor, the Engineer and the Buyer. The guidelines shall include the following minimum check items.

1. Field Verification of Installed Equipment including:

a. Pumps, Compressors, Blowers, Tankage

b. Piping Systems and Temporary Connections

c. Electrical Control and Operator Interface Systems

2. Commissioning of Equipment

a. Feed Pumps, Filtrate Pumps (vacuum system), Vacuum Pumps, Metering Pumps, Compressors, Blowers

b. Switches, Transmitters, Analyzers

c. Modulating Manual and Automated Valves

3. Start-up Activities

a. Feed, Filtered Water and Backwash Flow Pressure and Level Control Sequences

b. Membrane Treatment Unit Operations including filtration, backwashing clean in place and membrane integrity testing.

c. Normal and Emergency Start Up and Shut Down Sequences.

d. Process Interlocks

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 COMMISSIONING

A. No system or subsystem shall be started-up for continuous operation unless all Goods, including instrumentation and monitoring systems, of that system or subsystem have been tested and proven to be operable as intended by the Contract Documents.

B. The Seller shall place the Goods into operation and perform tests to determine if equipment is operating properly. The purpose of these tests is to verify that both the System and each Unit are:

1. Properly installed

2. Operational

3. Capable of completing an operating cycles free of problems

4. Free from pump or valve cavitation, water hammer, overheating, overloading, vibration, or other operating problems.

5. The Seller shall verify that control programming has been configured with appropriate software time delays to avoid rapid pump or membrane flow cycling in response to transient dynamic hydraulic effects caused by backwash, or chemical washing cycles or other process cycles (e.g. start - up, shut down, membrane test). “Dead-heading” or any operation of any pump under a “zero-flow” or “flow condition below the pump manufacturers acceptable limits” is not acceptable. Interlocks shall be provided to prevent operation of the any pump under a “dead-headed” condition. The pump manufacturers “maximum number of pumps starts per hour” shall not be exceeded.

C. The Seller shall coordinate all activities with the Contractor, Buyer and Engineer. The types of activities to be performed by the Seller will be detailed in the “Detailed Plan of Commissioning Activities” include but not necessarily limited to the following items:

1. Initial Start Up Activities

   a. Verify Unit and Piping Installation

   b. Verify Valve Tags

   c. Verify temporary system interconnections

   d. Verify Instrumentation and Control

      1) Verify Fiber Optic System

      2) Verify PLC Communication

      3) Verify PC or Operator Interface Communication

2. Commissioning Activities

   a. Verify Pumps for Rotation

   b. Commission Compressed Air System

   c. Commission Blower System

   d. Test Modulating Valves

   e. Test Chemical Feed Systems used for feed and backwash

   f. Test Chemical Feed Systems used in Clean-In-Place

   g. Test Level Switches in Tanks

   h. Test Pressure Switches

i. Set Mechanical Seals in Pumps and Flush System

j. Test and Calibrate Process Instruments

1) Flow Meters

2) Pressure Transmitters

3) Level Transmitters

4) Turbidity Meters

5) Chlorine Residual Analyzers

6) pH/ORP Meters

7) Conductivity Meters

8) Temperature Transmitters

k. Miscellaneous Equipment

l. Field Located Manual Valves

m. Field Located Automatic Valves

n. Manual Unit Valves

o. Automatic Unit Valves

p. Flush Piping Systems

3. Start Up Activities

a. Complete Operational Readiness Test (ORT)

b. Feed Flow / Pressure / Level Control System in Manual the Automatic Mode

c. Filtrate Pressure Flow / Pressure / Level Control System in Manual the Automatic Mode

d. Backwash Flow / Pressure Level / Control System in Manual the Automatic Mode

e. Backwash Process Residuals Flow / Pressure Level / Control System in Manual the Automatic Mode

f. Filtration Units Placed into Service in Manual the Automatic Mode

g. Check Start Up Sequence in Normal and Emergency Modes

h. Check Shut Down Sequence in Normal and Emergency Modes

i. Check Process Logic Interlocks

j. Remove Temporary Interconnections

k. Disinfect Piping (if applicable)

l. Install Membrane Modules

m. Place Membrane System in Operation

1) Verify Filtration Sequence

2) Verify Backwash Sequence

3) Verify Membrane Test Sequence

4) Verify Other Seller Process Sequences

n. Chemically Clean Membrane Units

o. Perform Functional Acceptance Test

D. As a part of the commissioning, the Seller shall start-up and operate all support systems provided by or required by the Seller for operation of the system, including but not limited to chemical feed systems, instrumentation, air compression equipment, and electric controls. This testing shall demonstrate that there are no water or air leaks in the System, that the piping has been installed and connected properly, that the electrical system is operating correctly, and that the instrumentation has been properly calibrated.

E. The Seller shall furnish materials (excluding chemicals and power), instruments, and incidental and expendable equipment required for commissioning / placing the equipment into operation. The Seller shall retain the services of any manufacturers representatives as required in the Contract Documents to assist with the commissioning / placing into operation of the Goods. The costs of these services shall be borne by the Seller

F. The Seller shall oversee the installation the membrane modules by the Contractor. The location and serial number of each membrane module shall be provided using a Microsoft Excel Spreadsheet. This information will be used to document Membrane Warranty replacement. Membrane module information shall be collated and submitted to the Buyer as part of the Commissioning Test Reports Manual.

G. Once the membrane modules have been installed, the Seller shall conduct a membrane integrity test on each Unit. The Seller shall provide the Engineer with both the integrity test results for each Unit and results documenting that each installed Unit has passed the integrity test. The Seller shall repair or replace any defective membranes.

H. When requested by the Seller, the Engineer shall review the operation of the equipment to verify that the commissioning is complete.

1. The Engineer shall perform random tests to determine if the equipment is operating properly and witness various operational sequences.

2. Perform and review the results of the Functional Acceptance Test (FAT)

3. The Engineer may initiate alarm conditions to determine if the control system is functioning properly.

4. The Engineers review shall include a review of the HMI interface and PLC SCADA system commissioning requirements

5. The Engineers review shall identify any equipment that has not been properly installed, or operating, detailing the outstanding installation issues on a “punch list” and noting the party who shall be responsible for each correction and identify the items require that correction.

I. Upon satisfactory completion of the review, the Engineer shall submit to the Seller a written “Notice of Completed Commissioning”.

J. Once the “Notice of Completed Commissioning” is issued, Training of Operation and Maintenance Personnel may commence. Refer to Section 01 73 10, Training of Operations and Maintenance Personnel.

END OF SECTION

# SECTION 01 67 00 ACCEPTANCE TESTING OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work: The Seller shall perform an Acceptance Testing of the membrane equipment. Acceptance Testing is subject to the following provisions.

1. Acceptance Testing shall not commence until the Notice of Completed Training is issued in accordance with Section 01 73 10, Training of Operations and Maintenance Personnel.

2. Acceptance Testing shall commence within 7 days after completion of training or at a mutually agreed upon time by the Seller, Buyer, Contractor and Engineer.

3. Acceptance Testing shall extend for a period of 30 consecutive days.

4. Acceptance Testing shall be completed by the Seller within the allocated time identified in the Agreement.

5. Failure to complete the Acceptance Testing as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until Acceptance Testing is complete.

6. The Engineer shall document the time when the facilities are substantially unavailable for use by the Seller to perform Acceptance Testing due to circumstances beyond the control of the Seller including but not limited to power outages, lack of feedwater, inability to transfer product water or feedwater due to factors beyond the control of the Seller, not having adequate staff from the Contractor or the Buyer. If in the sole opinion of the Engineer the facilities are substantially unavailable to the Seller, equivalent additional Acceptance Testing time will be granted.

7. The date that the Acceptance Testing ends shall be used by the Engineer for the date of the membrane equipment “Notice of Substantial Completion”. The “Notice of Substantial Completion” shall be issued by the Engineer upon completion of FINAL Operational and Maintenance Manuals.

B. Reference Specifications

1. Section 01 73 10, Training of Operations and Maintenance Personnel

2. Section 11 30 10, Hollow Fiber Membrane Equipment

C. Coordination

1. The Seller shall coordinate all services and activities required by this Section with the Contractor, Buyer and the Engineer.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. Upon completion of the Acceptance Testing, the Seller shall submit to the Buyer a written report detailing the results of the Acceptance Testing, including a copy of all field notes and test data.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 ACCEPTANCE TESTING

A. Upon completion of the Operator Training in accordance with the requirements of Section 01 73 10, Training of Operational and Maintenance Personnel, the Seller shall perform an Acceptance Test on the System. Each UNIT shall be tested concurrently but evaluated separately for performance.

B. The purpose of the Acceptance Testing is to demonstrate that equipment is:

1. Properly installed

2. Ready to be placed into service by the Buyer

3. In compliance with the service conditions, performance requirements, material specifications, and all other requirements of the Contract Documents

4. In compliance with the requirements of Instrumentation and Control System Testing (Reliability Acceptance Test, (RAT)).

C. The Seller shall furnish all materials, instruments, and incidental and expendable equipment required for Acceptance Testing, except where otherwise specified.

D. Throughout the Acceptance Testing period, a representative of the Seller shall be present on site during normal working hours and available via means of a pager or cellular communication during non-working hours in case of an emergency.

E. The Buyer or an authorized representative of the Buyer will be present to witness the Acceptance Testing.

F. The Seller shall keep detailed notes regarding the Acceptance Testing and record all test data and results. This will be done through operation of the data logging system. Upon successful completion of the Acceptance Testing, the Seller shall submit a written report on the Acceptance Testing, as specified in Paragraph 1.03.A of this Section.

G. The initial Acceptance Testing period will extend for 30 consecutive days with one or more Unit(s) per train of units operate at the design flow, with the other Units are equally balanced to treat the remaining raw water available for the 30- day period.

H. After the Acceptance Testing is completed, the Engineer and Buyer will meet with the Seller to determine compliance with the Contract Documents. At that time, if it is determined that the Seller has fulfilled the requirements of the Contract Documents, the Seller will be released from its on-site obligation unless otherwise retained.

I. If the Units do not meet the criteria of linear scalability as defined in the Agreement, or if the System does not perform in accordance with the Contract Documents, the Seller shall return or remain on site to perform all necessary corrections at the cost of the Seller until compliance with Contract Documents is demonstrated.

J. During the Acceptance Testing, the System shall perform in accordance with the guaranteed product water quality to allow the Buyer to discharge treated water.

K. If the Acceptance Testing is interrupted at the request of the Seller or by the non-conformance of the Seller's equipment for more than three instances or a cumulative downtime of more than six hours during the acceptance test, the Buyer or Engineer may require that Acceptance Testing be restarted from the beginning, at no cost to the Buyer.

L. Any interruption of the Acceptance Testing caused by circumstances beyond the control of the Seller shall not require the testing to be restarted from the beginning. Such events include any activities that would result in an inadvertent or unplanned shutdown of the PLC / HMI control System or otherwise interfere with the Reliability Acceptance Test. The elapsed time of Acceptance Testing prior to the interruption will be applied to the required testing period.

END OF SECTION

# SECTION 01 68 00 OPERATIONS ASSISTANCE

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. Operation Assistance to the Contractor: The Seller shall provide Operations Assistance to the Contractor for the Membrane Filtration System Equipment.

   a. The Seller shall provide the Contractor with Operational Assistance for the membrane system during times after the “Notice of Completed Commissioning” for the Membrane System has been issued but prior to the completion of Acceptance Testing.

   b. The Seller shall operate the membrane system as required by the Contractor to produce water that will be used for the Commissioning of the remaining facilities.

   c. Prior to the Notice of Substantial Completion, when requested by the Contractor, Operational Assistance shall be provided to the Buyer’s Personnel. Operational Assistance shall be provided for:

      1) Training of the Operations and Maintenance Personnel.

      2) Acceptance Testing.

      3) such times not specifically allocated as part of Training or Acceptance Testing.

   d. Up to 2 weeks of Operational Assistance shall be provided to the Contractor. This Operational assistance is required in addition to any specific requirements associated with Operator Training or Acceptance Testing.

2. Operation Assistance to the Buyer

   a. The Seller shall provide Operations Assistance to the Buyer during the correction period.

      1) Operations assistance shall consist of:

         a) 2 - 16 hour General Operations Assistance visits during the correction period.

         b) One 2-day Seller Training Refresher Course

         c) Seller Services during the Final Inspection

   b. General Operations Assistance shall consist of:

      1) Review of Membrane Filtration Unit Operational Logs

2) Review and Modification of PLC/HMI Programming Software to address system performance issues

3) Review of component equipment operation

4) Assistance to the Buyer's personnel during normal working hours

5) Answer Buyer questions regarding performance of the Membrane System

6) Respond to Warranty notices or claims.

c. Training following two months of regular system operations:

1) The system supplier shall provide 3 days of operation and maintenance training covering system equipment provided.

2) The training course shall be a refresher course covering the Membrane Filtration System.

3) The training course shall be a refresher course covering the PLC control system and HMI stations.

d. Final Inspection Site Visit.

1) The Seller shall attend and participate in the Final Inspection of the Membrane Equipment and respond to items identified by the Seller, Buyer or Engineer as being necessary to fulfill with the requirements of the Contract Documents.

B. Reference Specifications

1. Section 01 73 00, Installation, Operation and Maintenance Manuals

2. Section 01 73 10, Training of Operation and Maintenance Personnel

3. Section 11 30 00, Hollow Fiber Membrane Equipment

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC)

A. Manufacturer's Field Services

1. The representative shall be an employee of the Seller. The Seller shall provide one of the representatives associated with the Commissioning, Training and Acceptance Testing of the Membrane Pretreatment System.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 MANUFACTURERS FIELD SERVICES

A. The Seller's Project Manager shall participate in the Final Inspection to resolve any outstanding issues. The Seller shall correct any items identified by the Buyer or the Engineer during final inspection and resolve said items prior to the issuance of the Notice of Acceptability by the Engineer.

END OF SECTION

# SECTION 01 73 00 INSTALLATION, OPERATION AND MAINTENANCE MANUALS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. Provide INSTALLATION, PRELIMINARY and FINAL Operational and Maintenance (O&M) Manuals for use by the Contractor and the Buyer.

a. The term "Operation and Maintenance Manual" includes all product related information and documents which are required for preparation of the Membrane Filtration System O&M Manual, and data that is required for inclusion by current regulations of any participating government agency or as a provision of a membrane system warranty.

b. Failure to provide the INSTALLATION, PRELIMINARY and FINAL Operational and Maintenance (O&M) Manuals as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until Manuals have been received. Required Delivery for O&M Manuals are as follows:

1) INSTALLATION Manuals are due 30 days before the Goods are delivered to the Point of Destination.

2) PRELIMINARY O&M Manuals are due 30 days before Commissioning.

3) FINAL O&M Manuals are due 30 days after the completion of Acceptance Testing.

c. The term component equipment supplier is used to describe a manufacturer’s Goods purchased by the Seller and incorporated into the Membrane Filtration System.

d. The O&M Manual shall include, but not be limited to, the following:

1) Equipment function, operating characteristics, limiting conditions, operating instructions and procedures for startup, normal and emergency conditions, shutdown and storage

2) Safety considerations relating to installation, operation and maintenance procedures

3) Installation procedures

4) Calibration procedures

5) Routine and preventive maintenance instructions

6) Procedures for disassembly, reassembly, alignment, adjustment, and inspection instructions

7) Recommended spare parts list to maintain equipment in service

8) Special Tools:

   a) For Seller equipment, provide list of special tools included and required for installation checking, testing, parts replacement, and maintenance

   b) For component equipment, a list of special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance with current price information

9) For component equipment provide name, address and telephone number for local sources of equipment and/or replacement parts

10) Operational log sheets and maintenance schedules

11) Material Safety Data Sheets (MSDSs) for any applicable item (chemicals, oils, lubricants, etc) provided by the Seller

12) Furnish lubricants of the type and grade necessary to meet the requirements of the equipment. Provide lubricants that are NSF Standard 61 approved as food grade and that are compatible for use in public water supplies

13) Warranty Information, Bond(s), and Service contract(s), if applicable

14) Equipment Specific and Factory Test Report information shall include:

   a) Tag name, Model and Serial number of the equipment provided

   b) Name, address, and phone number of manufacturer, manufacturer's local service representative

   c) Factory Test Reports where applicable

   d) Approved Shop Drawings (including equipment drawings, schematics, circuit diagrams)

e. Routine and preventive maintenance instructions include all information and instructions required to keep equipment properly lubricated, adjusted, and maintained so that the item functions as intended throughout its full design life. Routine and preventive maintenance instructions shall include, but not be limited to, the following:

   1) Written explanations with illustrations for each preventive maintenance task

   2) Recommended schedule for execution of preventive maintenance tasks

   3) Lubrication charts shall include a table of alternative lubricants naming at least two alternate lubricant manufacturers, with applicable product numbers, for each application

   4) Troubleshooting instructions

5) List of required maintenance tools and equipment

B. Reference Specifications

1. Division 11, Equipment

C. Coordination

1. The Seller shall coordinate the delivery and incorporation of O&M Manuals prepared for this project by the Seller or provided from their component equipment suppliers. The Seller shall develop an O&M Manual for the equipment and systems designed and provided by the Seller under this contract.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) – (NOT USED)

1.03 SUBMITTALS

A. General

1. Installation, Commissioning, Training of any process, or piece of equipment shall not be permitted until the respective INSTALLATION or PRELIMINARY manuals have been received and approved by the Engineer as being sufficient in content to allow the completion of the work.

2. O&M Manuals shall be submitted in three ring binders with a table of contents and index tabs to identify the various items.

3. The table of contents shall reference the applicable specification section(s) for each item and shall be included in each volume of multi-volume manuals.

4. O&M manuals shall use dividers and indexed tabs between major categories of information such as Operating Instructions, Preventive Maintenance Instructions, etc.

5. O&M manuals shall use 8-1/2-inch by 11-inch acid free paper of high rag content and quality. All text must be legible, type-written or machine printed originals or high quality copies.

6. Each page shall have a binding margin of approximately 1-1/2 inches and be punched for placement in a three-ring " D" style loose-leaf binder, which shall be provided by the Seller along with the submittal. Each binder shall be no more than 3 inches.

7. Drawings: Provide full size blueprints (24 x 36) and Half-size black line (11 x 17) reproductions shall be provided for all project drawings. 11-inch x 17- inch drawings shall be bound in a separate binder. 11-inch x 17-inch drawings shall not be folded and placed in any project binder designed for 8½ inch x 11 inch pages.

8. Electronic File Format for CD

a. All Seller O&M Manual information shall be supplied to the Buyer as electronic file format that it was originally developed and in condensed portable document format (.PDF format). The specifications for PDF generation are as follows:

1) The acceptable format is Portable Document Format (PDF): Adobe Acrobat or Adobe Acrobat Exchange

2) The initial filename for the EOM submittal is provided with the request for final O&M manuals. The filename is posted near the top of the review form. Filenames use the “eight dot three” convention (XXXXX_YY.PDF) where XXXXX is the specification section number and YY is an ID number. If technical problems require you to break the submittal into more than one file then add a letter extension to the end of each filename. (example: 19876_01A.PDF) Keep the number of files to a minimum.

3) Scan images at a resolution of 400 dpi or greater. Perform Optical Character Recognition (OCR) capture on all images. Achieve OCR with the “original image with hidden text” option (as seen in Adobe Acrobat Exchange 4.05).

4) Create one PDF document (PDF file) for each equipment O&M Manual. The entire manual is converted to a single PDF file via scanning or other method of conversion. Drawing or other graphics must be converted to PDF format and made part of the one PDF document. Rotate pages that must be viewed in landscape to the appropriate position for easy reading. Word searches of the PDF document must operate successfully. (proof of OCR)

5) Create a bookmark in the navigation frame, for each entry in the Table of contents. Three levels deep is usually enough (i.e. Chapter, Section, Sub-section)

6) Generate thumbnails for each completed PDF file.

7) Set the opening view for PDF files as follows:

a) Initial view: Bookmarks and page

b) Magnification: Fit in window

c) Open to the cover page of the manual, with bookmarks to the left, and the first bookmark linked to the table of contents.

b. All component equipment manuals shall be provided in .PDF format.

c. All Project drawings shall be provided in AutoCAD 2000 and .PDF format.

9. Equipment Identification

a. Identify products and components by their Tag and descriptive names. The use of cryptic model or catalog numbers or letters for identifica- tion shall not be acceptable.

b. Indicate all components of the equipment on catalog pages by bold markings or some other clearly definable medium for ease of identification. All markings shall be readable if photocopied.

B. Letter of Transmittal:

a. The Seller shall provide a Letter of Transmittal with each submittal and include the following in the letter:

b. Date of submittal.

c. Contract title and number.

d. Seller's name and address.

e. A list of the attachments and the Sections of the Manual to which they relate.

f. Reference to or explanation of related submittals already made or to be made at a future date.

C. The Seller shall prepare INSTALLATION Manuals for the Installation of the Goods by the Contractor.

1. The Seller shall submit six copies marked "INSTALLATION" of each required O&M manual to the Contractor. Each manual shall include a CD containing the information contained in the manual. Distribution by Contractor shall be as follows:

a. The Contactor shall retain 3 copies

b. The Engineer shall receive 2 copies

c. The Buyer shall receive 1 copy

2. The Seller shall organize the "INSTALLATION" manuals as follows

a. Seller Equipment Installation Manual

1) Seller Equipment Installation Instructions

2) Contractor Training Information

3) Painting Touch up and Repair Instructions

4) Equipment Cross-Reference Schedules

a) For all tagged devices supplied, the Seller shall develop an "Cross Reference Schedule" that matches the Tag to the appropriate equipment manual. The equipment schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range. The equipment cross-reference schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

b. Component Equipment O&M Manuals

1) Includes all Division 5, Division 11, (excluding membrane equipment) and Division 15 approved or "as constructed by Seller" shop drawing submittals and equipment Installation, Operational and Maintenance Manuals.

c. Instrumentation and Control Equipment Manuals

1) Includes all Division 13 approved or “as constructed by Seller” Shop Drawing Submittals and Equipment Installation Operational and Maintenance Manuals.

d. Electrical Equipment Manuals

1) Includes all Division 16 approved or “as constructed by Seller” Shop Drawing Submittals and Equipment Installation, Operational and Maintenance Manuals.

e. All “As Constructed” Project Drawings

D. PRELIMINARY O&M Manual:

1. The Seller shall submit six copies marked “PRELIMINARY” of each required O&M manual and the training plan. Each manual shall include a CD containing the information contained in the manual.

2. The Seller shall organize the PRELIMINARY O&M Manuals as follows:

a. Seller Equipment O&M Manual

1) Includes O&M and Preventive Maintenance Instructions

2) Includes Detailed Plan of Commissioning Activities

3) Includes the Equipment Cross-Reference Schedule

b. Component O&M Manuals

1) Includes all Division 5, Division 11, (excluding membrane equipment) and Division 15 approved or “ as constructed by Seller” equipment Installation, Operational and Maintenance Manuals.

c. Instrumentation and Control O&M Manuals

d. Electrical Equipment Manuals

e. Equipment Specific and Factory Test Reports Manual

f. Seller and Component Equipment Suppliers Training Manual(s)

g. All “As Constructed” Project Drawings

E. After the Acceptance Testing has been completed the Seller shall revise and resubmit the FINAL O&M Manuals for the project. Eight final copies of each of the required Operation and Maintenance Manuals shall be submitted. Each manual shall contain a CD containing the information contained in the manual.

1. FINAL O&M Manual(s):

2. The Seller shall submit six copies marked “FINAL” of each required O&M Manual. Each manual shall include a CD containing the information contained in the manual.

    a. The Seller shall organize the FINAL O&M Manuals as follows:

        1) Seller Equipment O&M Manual

        2) This O&M Manual will be provided “as new in its entirety.”

        3) Includes O&M and Preventive Maintenance Instructions

        4) Includes an equipment cross-reference schedule

        5) Includes a FINAL CD

    b. Component O&M Manuals

        1) This Manual will include only changes from the PRELIMINARY to FINAL Versions. The Seller shall provide new Manual Covers or Binders

        2) Includes a FINAL CD

    c. Instrumentation and Control O&M Manuals

        1) The Seller PLC/HMI Manuals will be provided “as new in its entirety.”

        2) The component equipment manuals include only changes from the PRELIMINARY to FINAL Versions. The Seller shall provide new Manual Covers or Binders

        3) Includes a FINAL CD.

    d. Electrical Equipment Manuals

        1) The Electrical Equipment Manuals include only changes from the PRELIMINARY to FINAL Versions. The Seller shall provide new Manual Covers or Binders

        2) Includes all Electrical, Shop Drawing Submittals and Component Equipment O&M Manuals

        3) Includes a FINAL CD

    e. Equipment Specific and Factory Test Reports Manual

        1) The FINAL Factory Test Report Manual shall include only changes from the PRELIMINARY to FINAL Versions for Component Equipment. The Seller shall provide new Manual Covers or Binders.

    f. Commissioning Test Reports Manual shall include:

        1) Results of all installation inspection, field calibration, and field testing reports prepared during the commissioning of the facility

2) Results of membrane module installation and integrity testing

3) Results of Acceptance Testing

g. All “as installed” project drawings will be provided “as new in its entirety” and include a FINAL CD.

**PART 2 -- PRODUCTS - NOT USED**

**PART 3 -- EXECUTION - NOT USED**

END OF SECTION

# SECTION 01 73 10 TRAINING OF OPERATIONS AND MAINTENANCE PERSONNEL

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. The Seller shall provide formal training of the Buyers' personnel. Training shall commence after the "Notice of Completed Commissioning" is issued.

   a. Training of the Buyer's personnel shall commence within a period of 14 days after the "Notice of Completed Commissioning" has been issued as mutually agreed to by the Buyer, Engineer, Contractor and Seller.

   b. Training shall be conducted for first shift during normal working hours.

   c. Training shall be completed within the time allocated in the Agreement.

   d. The Engineer shall document the time when the facilities are substantially unavailable for use by the Seller to perform training due to circumstances beyond the control of the Seller including but not limited to power outages, lack of feedwater, inability to transfer product water or feedwater due to factors beyond the control of the Seller, not having adequate staff from the Contractor or the Buyer. If in the sole opinion of the Engineer the facilities are substantially unavailable to the Seller, equivalent additional time for training will be granted.

   e. Failure of the Seller to complete the Training as required by this Section within the allocated time, shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until Training is complete.

   f. Upon successful completion of the Training required by this Section, the Engineer will issue a "Notice of Completed Training".

   g. The Seller shall maintain record of the individuals that have completed training and provide information required for the documentation of Professional Development Hours required for the Buyer's personnel.

2. The Seller shall provide the services of factory-trained specialists to train the Buyer's personnel in the recommended operation and the preventive maintenance procedures for all equipment provided by the Contract Documents.

3. The Seller shall provide a combination of classroom and hands-on training. All training shall be conducted at the Buyer's location.

4. The following Levels of Training Shall Be Provided.

| Level of Training | Number of Shifts | Maximum Number of Participants | Classroom Training (Hours) | Hands-On Training (Hours) |
|---|---|---|---|---|
| Membrane System | 1 | 8 | 8 | 16 |
| Mechanical Equipment | 1 | 8 | 8 | 16 |
| Instrumentation and Control Equipment | 1 | 4 | 8 | 16 |
| PLC / HMI | 1 | 4 | 16 | 16 |

5. Hands-On Training shall be limited to groups of 8. In the event that more than 8 personnel are to be trained, multiple hands-on training sessions shall be conducted.

6. The Seller shall be responsible for all costs associated with training and shall provide required materials, texts, and supplies.

7. Training shall be conducted in normal eight (8) hour working days until conclusion of the training course.

8. Training sessions may be video recorded by the Buyer at the Buyer's expense.

9. Training material shall be provided to the Buyer in written and electronic format.

10. Training shall be performed by the Seller and component equipment suppliers. The Seller shall be responsible for the training on the design and operation of the equipment and systems provided. This includes:

    a. Membrane System

        1) Membrane Filtration Theory

        2) Membrane Filtration System

        3) Membrane Filtration Units

        4) Membrane Filtration Processes

            a) Start Up, Shut Down

            b) Filtration, Backwashing

            c) Maintenance Cleaning, Chemical Washing, Backwash and Clean in Place

d) Integrity Testing and Module Repair

5) Routine and Non-Routine Maintenance

b. Component Equipment Training

1) Equipment, Equipment (including pumps, compressors)

2) Mechanical, Equipment (valves, actuators, and positioners)

c. Instrumentation and Control Component Equipment Training

1) Switches

2) Meters and Transmitters

3) Analyzers

d. Instrumentation and Control Process Logic Control/HMI Training

1) Process Logic Control Equipment

2) HMI System Training

11. Component Equipment Suppliers: The Seller shall retain the services of manufacturer's representative(s) for training of the following equipment provided by the Seller.

a. Pumps

b. Compressors

c. Process Logic Control Equipment

d. HMI System Programming

e. Other equipment provided by the Seller where the Seller is not qualified to provide authorized factory level training

B. Reference Specifications

1. Section 01 66 00, Commissioning of Membrane Equipment

2. Section 01 67 00, Acceptance Testing

3. Section 01 73 00, Installation, Operation and Maintenance Manuals

4. Section 11 21 10, Horizontal End Suction Pumps

5. Section 11 30 00, Hollow Fiber Membrane Equipment

C. Coordination:

1. The Seller shall coordinate these services at times acceptable to the Buyer, with a minimum of 5 days prior notice.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC)

1. The qualifications of specialists shall meet the requirements of this Section and are subject to approval by the Engineer.

1.03 SUBMITTALS

A. Training Manuals shall be provided with the PRELIMINARY O&M Manuals. Refer to Section 01 73 00, Installation, Operation and Maintenance Manuals.

B. The Seller shall develop and submit to the Engineer and Buyer a Training Manual. The Training Manual Plan shall include the elements presented in this Section or as required by the Seller or component equipment supplier.

C. The Seller shall prepare a Training Lesson Plan, provide qualified instructors, and schedule the training in an organized manner.

1. Proposed lesson plans for scheduled instruction shall be submitted 15 days prior to the commencement of training. Lesson plans shall be approved by the Engineer a minimum of 5 days prior to scheduled instruction. All training material shall be provided to the Buyer in electronic format.

2. Credentials for the Seller’s designated instructor(s) shall be submitted thirty (30) days prior to the commencement of training. Credentials shall include a brief resume and specific details of the instructor(s) pertaining both to personal experience operating and maintaining the specified equipment and conducting operation and maintenance for the same equipment.

3. The Seller’s proposed lesson plans shall detail specific instruction topics. Training aids to be utilized in the instruction shall be referenced and attached where applicable to the proposed lesson plan. "Hands-on" demonstrations planned for the instruction shall be described in the lesson plan.

4. The Seller shall indicate the estimated duration of each segment of the training in the lesson plan.

5. Submit information as required by the local primacy agency in support of Professional Development Hours.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING (NOT USED)

1.05 SPECIAL PROJECT CONSIDERATIONS

A. Training Aids

1. The Seller’s instructor shall incorporate training aids as appropriate to assist in the instruction. As a minimum, the training aids shall include text and figure handouts. Texts shall be bound within three-ring binders. Other appropriate training aids are:

a. Audio-visual aids (e.g., films, slides, videotapes, overhead transparencies, posters, blueprints, diagrams, catalogue sheets)

b. Equipment cutaways and samples (e.g., spare parts and damaged equipment)

c. Tools (e.g., repair tools, customized tools, measuring and calibrating instruments)

2. The Seller's instructor shall utilize descriptive class handouts during the instruction. Photocopied class handouts shall be good quality reproductions. Class handouts should accompany the instruction with frequent reference made to them. Customized handouts developed especially for the instruction are required. Handouts planned for the instruction shall be attached with the manufacturer's proposed lesson plan.

B. "Hands-On Demonstration"

1. The Seller's instructor shall present "hands-on" demonstrations of operations and maintenance of the Seller supplied and component equipment. The proposed "hands-on" demonstrations should be described in the Seller's proposed lesson plan.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 OPERATOR TRAINING

A. Training: The instruction lesson plan shall include the following as a minimum:

1. Equipment Operation:

a. Describe equipment's operating (process) function

b. Describe equipment's fundamental operating principals and dynamics

c. Identify equipment's mechanical, electrical, and electronic components and features

d. Identify all support equipment associated with the operation of subject equipment (e.g., compressed air intake filters, valve actuators, motors)

e. Recommend standard operating procedures to address start-up, routine monitoring, and shut-down of the equipment

2. Detailed Component Description:

a. Identify and describe in detail each component's function

b. Group related components into subsystems, where applicable. Describe subsystem functions and their interaction with other subsystems

c. Identify and describe in detail equipment safeties and control interlocks

3. Equipment Preventive Maintenance (PM):

   a. Describe PM inspection procedures required to:

      1) Perform an inspection of the equipment in operation

      2) Spot potential trouble symptoms and anticipate breakdowns

      3) Forecast maintenance requirements (predictive maintenance)

   b. Define the recommended PM intervals for each component

   c. Provide lubricant and replacement part recommendations and limitations

   d. Describe appropriate cleaning practices and recommend intervals

   e. Identify and describe the use of special tools required for maintenance of the equipment

   f. Describe component removal/installation and disassembly/assembly procedures

   g. Perform "hands-on" demonstrations of preventive maintenance procedures

   h. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate

   i. Define recommended torquing, mounting, calibration, and/or alignment procedures and settings, as appropriate

   j. Describe recommended procedures to check/test equipment following a corrective repair.

4. Equipment Troubleshooting

   a. Define recommended systematic troubleshooting procedures

   b. Provide component specific troubleshooting checklists

   c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting

END OF SECTION

# SECTION 01 74 00 MEMBRANE SYSTEM AND MODULE WARRANTY

## PART 1 -- GENERAL

### 1.01 SUMMARY

A. Section includes:

1. Membrane system and module warranty information.

2. This section covers the membrane system equipment and module warranty. This section addresses the requirements in conjunction with the provisions of Paragraphs 9.01, 9.03 and 9.04 of the General Conditions.

B. Related specification sections include but are not necessarily limited to:

1. Division 00, Procurement and Contracting Requirements.

2. Division 01, General Requirements.

3. Section 11 30 00, Hollow Fiber Membrane Equipment

### 1.02 QUALITY ASSURANCE

A. Referenced standards:

1. ASTM International:

a. D6908, Standard Practice for Integrity Testing of Water Filtration Membrane Systems.

B. Seller's Quality Assurance/Quality Control (QA/QC) Procedures

1. Submit for approval, prior to the shipment of the membrane modules, reports in letter format for each membrane module. At a minimum, the reports shall include:

a. The membrane module model and part number, manufacturing lot number and serial number. Indicate the nominal and absolute pore size, inside and outside fiber diameter, effective fiber length, and effective feed side surface area of the membrane module.

b. The membrane module normalized specific flux (permeability, gfd/psi at 20°C).

c. A certification by the membrane module supplier that:

1) Each membrane module has passed the Seller's QA/QC (integrity) tests.

d. Certification of wet testing for each membrane module conducted at the Seller's facilities. Seller shall certify that each membrane module has passed the QA/QC tests for membrane element integrity. Acceptable QA/QC tests include bubble point or pressure hold tests above the minimum value recommended by the Seller and approved by the Engineer.

e. Identify modules that have undergone pinning or repair for more than 0.1 percent of original fibers at the factory.

2. Certificates of Warranty

a. Submit a listing of chemical constituents, concentrations and exposure times that would void the membrane warranty.

1.03 DEFINITIONS

A. Log Reduction Value (LRV): The filtration removal efficiency expressed as $\log_{10}$ for a target organism or surrogate.

B. Membrane Module(s): Hollow fiber membranes arranged as a module that is a sub-assembly of a MF/UF Unit.

C. Membrane Integrity Failure Occurrence:

1. A loss of integrity (e.g., partial or complete fiber breaks) that results in less than 4-log (LRV of 4 or 99.99 percent filtration efficiency for a removal of 3 micron or larger particles) as determined by an air pressure based Direct Integrity Test such as the:

a. Pressure Decay Test.

b. Diffusive Airflow Test.

c. Correlated Airflow Measurement Test:

1) A pressure decay test, applying Hagen-Poisseville equation per ASTM D6908.

d. Other conforming integrity tests that satisfy the criteria for test resolution and sensitivity as described by any recognized independent method developed by a consortium of membrane module manufacturers or described and accepted as a method by the primacy agency.

2. MF/UF System: The complete MF/UF System is comprised of multiple MF/UF Units and all ancillary equipment.

D. MF/UF Unit(s): One (1) complete filtration unit including valves, pumps, controls, and piping capable of producing filtered water.

E. Substantial Completion: See Division 0, General Conditions.

1.04 SUBMITTALS

A. Shop Drawings

1. Membrane Warranty

a. Submit design calculations to substantiate the 4-Log Membrane LRVs for air pressure integrity testing. Perform calculations based upon a broken fiber·lumen(s) or a microporous defect of 3 microns to determine the worst-case membrane integrity defect scenario.

b. Provide a listing of chemical constituents, concentrations and exposure times that would result in voiding the membrane warranty.

c. For each of the above chemical constituents, identify the instrumentation required and alarm limits necessary to satisfy the warranty provisions of this section.

2. MF Membrane Modules:

a. Include module construction details.

1) Materials of construction.

2) Dimensions.

3) Standard commercial part numbers and materials for elastomeric seals. Note that Buna-N seals are not acceptable.

b. Include standard performance parameters.

1) Operating temperature.

2) pH and oxidant tolerance (continuous and intermittent).

3) Range of membrane flux.

4) Clean water normalized specific flux (permeability or resistivity).

5) Minimum bubble point or maximum pressure decay test parameters.

c. Include storage and handling requirements.

d. Provide standard operating and maintenance data including storage solutions (concentration and volume) used during shipment and recommended rinsing solutions (concentration and volume) and long-term/short-term storage protocols.

B. Factory Test Reports

1. Prior to delivery of the membrane modules, submit the following:

a. Seller shall identify each membrane module by a unique serial number and indicate the membrane lot.

b. Seller shall provide the membrane specification sheets that specify each membrane module's normalized specific flux (gfd/psi at 20°C), nominal pore size, and the nominal inside and outside surface area of the filter module.

c. Certification of wet testing for each membrane module conducted at the Seller's facilities. Seller shall certify that each membrane module has passed the QA/QC tests for membrane element integrity. Acceptable QA/QC tests include bubble point or pressure hold tests above the minimum value recommended by the membrane module supplier and as approved by the Engineer.

C. Certificates of Warranty

1. The listing of chemical constituents, concentrations, and exposure time that would void the membrane warranty.

1.05 MEMBRANE SYSTEM WARRANTY

A. During the Correction Period, the Seller shall furnish an equipment warranty certificate assuring the containerized membrane filtration units and system (including membrane modules) will meet the service conditions specified in Section 11 30 00, Hollow Fiber Membrane Equipment, Paragraph 2.01.

B. Seller warrants satisfactory performance of the Goods to achieve equipment performance (e.g., design flows, water recovery, backwash, chemical washing, and Clean-In-Place (CIP) intervals) and water quality (e.g., integrity failure) objectives and complies with the concept of linear scalability as defined in the Agreement.

C. In the event that the Buyer does not believe that the Goods meet the specifications, including the criteria of linear scalability, the Buyer shall notify the Seller that the conditions for a breach of contract exist. Seller shall provide at no cost to the Buyer pilot equipment of the type and kind evaluated during the pilot testing, if not available to the Buyer, to verify the compliance with the specifications. In the event that the Buyer determines that the equipment does not comply with the specifications including the concept of linear scalability, the Seller shall provide an acceptable remedy to the Buyer in accordance with the General Conditions. If an acceptable remedy is not obtained, the Buyer shall notify the Seller that a breach of contract exists.

D. If the Goods are non-conforming and unable to conform to the equipment performance objectives for criteria other than linear scalability, the Buyer will notify the Seller in accordance with the procedures identified in Paragraph 9.03 of the General Conditions. Buyer shall make available to the Seller electronic records for Seller review. Seller shall be given 10 days to develop a plan to remedy the non-conformance.

E. If within 60 days after the notification to the Seller it has become apparent to the Buyer that the remedy is not acceptable, the Buyer will provide notice to the Seller that the conditions for breach of contract exist. If within 30 days an acceptable remedy is not obtained, the Buyer shall notify the Seller that a breach of contract exists.

F. Buyer recognizes that to remedy system warranty provisions, the Seller may need to modify operational protocols. Seller recognizes that any change to the operational protocols must be acceptable to the Buyer. Buyer recognizes that any changes to operational protocols by the Seller pursuant to this warranty provision are acceptable under the following conditions:

1. That the specified design parameters (e.g., production capacity, water quality, system recovery, and chemical cleaning interval) are obtained.

2. That the change in operational parameters and protocols (e.g., backwash, chemical washing, or chemical cleaning) will not represent an increase in operational or membrane replacement costs to the Buyer.

1.06 MEMBRANE MODULE WARRANTY

A. General:

1. Seller warrants that the membrane modules will be used for the treatment of water for drinking purposes and that in accordance with Paragraph 5.08 of the General Conditions the membrane modules are fit for the intended purpose.

2. Membrane modules and elements purchased by the Buyer or otherwise provided under the Agreement or as a future membrane replacement shall be provided with the same warranty as the membrane modules and elements provided as part of the original equipment installation.

3. Seller warrants that the membrane modules and elements will be free from non-conformance in:

a. Materials.

b. Workmanship.

c. Membrane integrity failure.

d. Irreversible flux loss.

B. Membrane Module and Element Warranty Periods

1. Seller shall warrant the performance of the supplied MF/UF membrane modules for a period of not less than ten (10) years (inclusive of the three (3) years full replacement warranty period) from the date of Substantial Completion.

a. The warranty shall guarantee the performance of the membrane modules so as to meet the MF/UF system design and performance criteria specified in Section 11 30 00, Hollow Fiber Membrane Equipment.

b. Membrane modules that within the first year become non-conforming, as defined by the requirements specified herein, must be replaced with new membrane modules at no cost to the Buyer.

2. Seller's membrane module and element warranty periods have been established in the Proposal.

a. Seller's membrane module warranty period shall commence with the date of Substantial Completion and continue until the end of the pro-rata warranty period submitted by the Seller with the Bid.

Clarification: offer is based on warranty commencing when water first touches membrane or 6 months after shipment, whichever comes first

b. The membrane module and element warranty periods shall consist of two (2) parts: a full replacement warranty period and a pro-rata warranty period.

1) The full replacement warranty period shall last for a period of at least three (3) years after the date of Substantial Completion as described below:

a) For membrane modules or elements supplied as part of the original equipment installation, the date of Substantial Completion is when the full replacement warranty period commences.

b) For membrane modules or elements provided after the start of Substantial Completion, the full replacement warranty period begins the date the membrane module or element is placed into service.

c) Buyer shall record and maintain records of the date of installation for all membrane modules and elements.

2) The pro-rata warranty period of seven (7) years shall commence with the end of the full replacement warranty period and last until the end of the pro-rata warranty period as submitted by the Seller in the Bid.

C. In the event that the Goods do not meet the performance requirements specified, including the criteria of linear scalability, the Buyer shall notify the Seller in writing requesting warranty replacement modules.

1. Following return notification, the Seller shall have an optional 10-day period to provide on-site troubleshooting and/or repair of the defective Goods.

D. In the event that the capacity or quality cannot be regained through these efforts, an adequate number of modules will be replaced as per the terms of the warranty to recover system performance within the parameters specified in Section 11 30 00, Hollow Fiber Membrane Equipment.

E. If within 60 days after the notification to the Seller it has become apparent to the Buyer that the remedy is not acceptable, the Buyer will provide notice to the Seller that the conditions for breach of contract exist.

1. If within 30 days following such notice an acceptable remedy is not obtained, the Buyer shall notify the Seller that a breach of contract exists.

F. Buyer recognizes that to remedy system warranty provisions, the Seller may need to modify operational protocols.

1. Seller recognizes that any changes to the operational protocols must be acceptable to the Buyer.

2. Buyer recognizes that any changes to operational protocols by the Seller pursuant to this warranty provision are acceptable under the following conditions:

a. That the specified design parameters (e.g., production capacity, water quality and system recovery) are obtained.

b. That the change in operational parameters and protocols (e.g., backwash, chemical cleaning, or recovery cleaning) will not represent an increase in operational or membrane replacement costs to the Buyer.

c. Revised protocol is subject to review and approval by the Buyer and/or Engineer.

G. Limitation of Membrane Module and Element Warranty

1. Buyer recognizes that the occurrence of any of the following shall void the membrane module and element warranties:

    a. Physical damage or faulty installation of the membrane modules or elements by anyone other than Contractor, Seller, or Seller's authorized representative.

    b. Unauthorized alteration of components manufactured by the Seller.

    c. Catastrophic exposure to chemicals or deleterious substances not normally associated with water treatment as a result of accidents, vandalism or other acts that are outside the bounds of routine and normal water treatment plant operations.

    d. Use of water treatment chemicals, chemical cleaning solutions or cleaning procedures other than chemicals, solutions and procedures approved by the Seller.

    e. Exposure of the membrane modules or elements to treated water or water treatment chemicals at concentrations above levels or contact times acceptable to the Seller.

        1) Seller is responsible for providing the Buyer a listing of the known water treatment and cleaning chemicals and concentrations and times of exposure that could result in membrane damage.

        2) Operation or cleaning of any membrane module or element outside the stated chemical limits shall void the remaining portion of the membrane module or element warranty.

    f. Improper maintenance of equipment, as defined in the Technical/O&M Manual.

    g. Failure of the Buyer to maintain operational logs as required by the Seller.

        1) The maintenance of electronic logs is subject to the following conditions:

            a) Seller is responsible for providing the Buyer a listing of the operational data points that are to be electronically logged.

            b) Seller is responsible for the control programming of data points that are to be electronically logged.

            c) Seller shall identify minimum frequencies of logging of all operational data points required by the Seller to maintain membrane module and element warranty provisions.

            d) Seller shall establish the alarm and shutdown limits that would result in the operation of the equipment outside of Seller acceptable limits.

            e) Seller shall be solely responsible for the identification and programming of system interlocks that would result in the operation of the system outside of the parameters required by the Seller.

                (a) Buyer will not be responsible for errors in Seller developed programming that would result in improper operation of the system.

h. In the event of a warranty claim, failure of the Buyer to provide the Seller with operational logs.

2. Buyer will assume responsibility of maintaining a hand-written log if an occurrence develops that is totally outside the bounds of routine and normal operation or automated operation.

   a. Such items would include obtaining water analyses, or catastrophic events (e.g., discharges of foreign objects or chemicals that are outside the normal operation of a water treatment facility).

3. Changes in the Seller established operational and maintenance guidelines cannot be applied retroactively to invalidate the membrane module or element warranties.

4. Seller is solely responsible for the identification of water quality parameters normally associated with water treatment and water treatment chemicals and cleaning solutions (for procedures approved by the Seller), and for identification of instrumentation and control programming required to satisfy and maintain membrane module and element warranty provisions for operation and cleaning.

5. Buyer recognizes that to satisfy warranty requirements, the Seller may provide membrane replacement modules or elements that embody changes in module or element design and construction features.

   a. Buyer recognizes that the replacement of membrane modules or elements pursuant to this warranty with a different membrane module or element is acceptable under the following conditions:

      1) That the specified design and operational parameters (e.g., design flows, water quality, system recovery and chemical cleaning intervals) are obtained.

      2) That the change in membrane modules or elements will not represent an increase in the operational or membrane module or element replacement costs to the Buyer.

      3) The revised module or element must also be in compliance with regulatory requirements.

H. Membrane Module and Element Pricing

~~1. Seller shall establish the membrane module and element prices (as indicated in the Proposal Pricing Form) and guarantees that:~~

~~a. Membrane modules and elements have been provided to the Buyer at prices not exceeding the prevailing market price.~~

~~b. In the Proposal Pricing Form, the Seller shall indicate the cost escalated Consumer Price Index (CPI) used to calculate the replacement price.~~

~~1) The CPI adjustment is the most recent Month CPI Index divided by the CPI Index for the month of the Bid submittal.~~

~~c. The CPI Index to be used shall be the "CPI-U, US City Average, all Items (non-seasonally adjusted)" as compiled by the U.S. Department of Labor.~~ [Addendum #3]

2. During the full replacement warranty period, the Seller shall provide replacement modules and elements for non-conforming modules and elements at no cost to the Buyer.

~~3. Module and element prices during the pro-rata warranty period shall be calculated as follows:~~

~~a. Pro Rata Module Price = (Module Price x applicable CPI adjustment x Months of Beneficial Use)/Membrane Module Pro-Rata Warranty Period (Months).~~ [Addendum #3]

I. Membrane Module Integrity:

1. Membrane Integrity Test Frequency:

a. Membrane Integrity testing shall be performed daily.

2. LRV Determination

a. The operating Log Reduction Value (LRV) shall be determined at the maximum design flux and maximum Transmembrane Pressure (TMP), if calculated using the test result on an intermittent basis.

b. The LRV shall be determined at the operating flux and TMP, if calculated using the test result on a continuous basis using the result of the last direct integrity test.

c. The LRV calculation shall include the applicable adjustment for the "concentration factor" as described in the Direct Integrity Test provisions of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

d. If empirical data is used for the calculation of LRV, the Seller will provide adequate evidence (e.g., results of challenge testing at the Seller membrane integrity test pressure, air and water flow/pressure drop data) to support the correlation between air pressure integrity test result and LRV based upon a "flow limiting orifice" criteria for a broken lumen at the membrane - membrane pot interface for approval by the Engineer.

3. Membrane Integrity Failure

a. Membrane modules shall be considered to have non-conforming integrity failure if the number of Membrane Integrity Failure Occurrences per membrane unit exceeds three (3) occurrences in a three (3) month period or six (6) occurrences in a 12 month period. A failing membrane integrity test shall be considered a Membrane Integrity Failure Occurrence if the problem is resolved by pinning of a membrane fiber. [Addendum #5]

1) Seller will define the number of fiber breaks per Unit that constitutes Membrane Integrity Failure Occurrence for their particular membrane module.

b. If a Membrane Integrity Failure Occurrence is identified:

1) Module(s) may be isolated from service and the system retested. If isolation of the modules(s) restores Unit integrity requirements, the Unit may be placed back into service.

2) The individual modules shall be pin repaired, or replaced if pin repair is not possible, and the Unit will be retested and returned to service. The membrane module serial number and number of membrane fibers repaired shall be recorded. The Membrane Integrity Failure Occurrence shall be documented by the Buyer.

3) For subsequent Membrane Integrity Failure Occurrences, module(s) may be isolated from service and the Unit placed back into service unless the cumulative area isolated from the Unit reduces the MF/UF System Firm Capacity below that which is required.

4) If module(s) cannot be isolated from service, then all defects in that Unit shall be repaired or replaced (if repair is not possible), and the Unit retested and placed back into service.

5) The membrane module serial number and number of membrane fibers repaired shall be recorded.

c. Individual membrane module(s) shall be considered to have integrity failure under the following conditions:

1) Prior to Acceptance Testing

a) If more than ~~0.05~~ 0.25 [Addendum #5] percent of the fibers are pinned prior to commencement of the Acceptance Testing.

2) After Acceptance Testing

a) If for a single membrane module, more than 0.05 percent of the fibers have required repair (e.g., by pinning or gluing) in any 12 consecutive months.

3) Anytime

a) An individual membrane fiber shall be defined as requiring repair if it visually leaks during an air pressure integrity test at the integrity test pressure.

b) If a module assembly fails the air pressure integrity test and cannot be repaired by pinning or gluing, then the module is considered defective.

c) If the cumulative repairs from the date of manufacture raise the flux rate 0.1 percent above the design flux rate.

d) If more than ~~0.2~~ 0.5 [Addendum #5] percent of the fibers have required repairs over the life of the membrane module. An individual membrane fiber shall be defined as requiring repair if it visually leaks during an air pressure integrity test at the integrity test pressure.

d. If a membrane unit exceeds the maximum amount of Membrane Integrity Failure Occurrences, all membrane modules within the membrane unit shall be replaced unless:

1) Seller can demonstrate, through lot traceability, that the Membrane Integrity Failure Occurrence is attributed to a specific lot of membrane modules within a previously defined range of consecutive serial numbers.

2) The lot size shall be established by the membrane module manufacturer but shall not be less than 25 modules.

3) The number of membrane modules that are accountable for the Membrane Integrity Failure Occurrences are “localized” to less than 10 percent of the membrane modules located on the membrane unit.

e. If it is demonstrated that the membrane integrity failure defect is attributed to a specific lot or localized, then all membrane modules that have had more than a single previous occurrence of repair shall be replaced, even though they may be located in another membrane unit or may not have exceeded the criteria for individual membrane module integrity failure.

f. If more than two (2) membrane units require complete replacement within a 12 month period, the Buyer shall retain the option to replace all remaining membrane modules.

g. After Final Acceptance, if a membrane module is determined to be non-conforming with respect to membrane integrity, the Seller will remedy in accordance with the requirements set forth in this section.

1) Non-conforming membrane modules may be returned to service under the conditions outlined in this section.

2) If within 60 days after the notification to the Seller it has become apparent to the Buyer that membrane modules are not able to meet the provisions of the warranty, the Buyer will provide the Seller with a breach of warranty claim.

J. Irreversible Flux Loss

1. Membrane modules or elements shall be considered to have non-conforming irreversible flux loss under the following condition.

Definition of “clean water” resistance: The temperature corrected membrane resistance is defined as the “clean water” membrane resistance, as indicated in the Proposal Pricing Form, taken at a minimum of one (1) hour after startup of the membrane unit after completion of the chemical cleaning process, and taken five (5) minutes after completion of the most recent backwash. The temperature correction shall be calculated at 20°C using a viscosity correction factor. The equations and units used to calculate “clean water: resistance are as follows:

$$R = \frac{\Delta P}{J\mu}$$

Where: R = Membrane Resistance (psid/gfdcp)
J = Membrane Flux (gfd)
μ = Viscosity of water (cp)
∆P = Differential Pressure (psid)

a. Irreversible Flux loss will be stated to have occurred if the MF/UF Units are not able to obtain a minimum of a 30-day clean-in-place (CIP) intervals respectively for 3 consecutive CIP intervals when operated at or below the temperature adjusted membrane design capacity using backwash (MF/UF Units only) and chemical washing procedures and frequencies established and demonstrated for the particular system during the Performance Testing Period.

b. Prior to the end of the first year or operation, each unit will be tested for permeability.

1) Prior to the permeability test, a CIP will be performed.

a) Seller will be allowed to observe the automated CIP cycle.

b) Bid temperature corrected flux rate will be set for each cell prior to the permeability test.

c) The permeability test duration will be run for a minimum of 5 minutes.

Exception: offer is based on baseline permeability of 7 gfd/psi (very conservative and over 4.5 times greater than terminal permeability). Detailed justification in envelope 2

2) If the permeability is not at least 95 percent of the ~~bid permeability~~ baseline permeability established following a CIP performed after at least 30 days of initial operation at the design capacity [Addendum #5], the modules will be considered to have non-conforming irreversible flux loss.

2. In the event that the Seller does not believe that the feed water quality is similar to that defined as the design water quality in Section 11 30 00, Hollow Fiber Membrane Equipment, then the Seller may seek relief from its warranty obligations hereunder to the extent that its failure to meet these obligations is caused by a change in the influent water quality that is outside the range of the design influent water quality parameters.

a. However, relief shall require demonstration that there is a defensible water quality parameter and/or duration that is outside of the influent water quality range that caused the warranty violation.

3. Should the Buyer and the Seller fail to agree on the cause of the warranty violation that is related to influent water quality, the matter shall be sent to binding arbitration.

a. The Buyer and the Seller shall jointly select an arbitration panel consisting of water treatment professionals appointed by each party.

b. The panel will consist of two members of each party or other mutually agreed upon number.

c. The panel will then select 1 additional member as mutually agreed upon.

4. The Buyer recognizes that to remedy warranty provisions for irreversible flux loss, the Seller may modify operational protocols.

a. Seller recognizes that changes to the operational protocols must be acceptable to the Buyer.

b. The Buyer recognizes that the changes to operational protocols by the Seller pursuant to this warranty provision are acceptable under the following conditions:

1) That the specified design parameters (e.g., production capacity, water quality, system recovery and CIP interval) are obtained.

2) That the change in operational parameters and protocols (e.g., backwash, Maintenance Clean or CIP) will not represent an increase in the operational or membrane replacement cost to the Buyer.

c. If more than two units require membrane replacement at any time within Membrane Module Warranty Period for irreversible flux loss, the Buyer shall retain the option to replace all remaining membrane modules using the applicable membrane module price.

**PART 2 -- PRODUCTS – (NOT USED)**

**PART 3 -- EXECUTION – (NOT USED)**

**PART 4 -- SUPPLEMENTAL INFORMATION**

4.01 MEMBRANE LIMITS

**Normal Operation**

| | |
|---|---|
| Transmembrane Pressure | -3 bar to + 3 bar (-43.5 psi to + 43.5 psi) |
| pH | 1 to 10 |
| Temperature | 0 to 40 degrees C. Consult Pall before using any water treatment polymers |

**Membrane Cleaning (Includes CIP/MC Processes)**

The following values are listed as maximum values that would potentially void the module warranty. Typical CIP and EFM values should be provided by Seller. [Addendum #5]

| | |
|---|---|
| Temperature | 40 degrees C. maximum |
| Sodium Hypochlorite | 5,000 mg/L maximum |
| ~~Hydrogen Peroxide~~ | ~~200 mg/L maximum~~ [Addendum #5] |
| NaOH | 20~~40~~ g/L maximum [Addendum #5] |
| Citric Acid | 100 ~~300~~ g/L maximum [Addendum #5] |

**Membrane Storage**

Store modules ~~between 1 and 40 degrees C. Do Not Freeze.~~

~~Short Term Storage: If not in use, flush daily with up to 100 mg/L of free available chlorine.~~

~~Long Term Storage: First perform a Clean in Place, store wet, completely filled with 50-mg/L sodium hypochlorite solution.~~ according to seller requirements [Addendum #5]

END OF SECTION

# SECTION 01 75 00 SPARE PARTS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. Spare parts and materials required to be supplied in the Contract Documents shall be furnished in unopened cartons, boxes, crates, or other protective covering suitable for preventing corrosion or deterioration for the maximum length of storage which may be normally anticipated. Packages shall be clearly marked and identified as to the name of Seller, applicable equipment, part number, description, and location on the equipment.

2. Spare parts and materials shall be delivered to the Buyer at the Point of Destination or other location specified by the Buyer prior to commencing Commissioning of the membrane system.

3. When a spare percentage is listed as a minimum requirement, the fractional quantities shall be rounded up to the nearest whole number. For example, if a 5 percent spare is listed, one spare is required for every 20; therefore, if 21 items were supplied as part of the Contract, 2 spares would be provided.

4. Provide a letter of transmittal and spare parts receiver form including the following:

   a. Date of letter and transfer of parts and material.

   b. Contract title and number.

   c. Seller's name and address.

   d. Applicable Sections of the Project Manual for each set of spare parts supplied.

   e. Acknowledgment signed by the Seller, that all spare parts and maintenance materials have been delivered.

5. The Seller shall be fully responsible for loss or damage to parts and materials until they are received by the Buyer.

1.02 QUALITY CONTROL I QUALITY ASSURANCE - NOT USED

1.03 SUBMITTALS

A. Shop Drawings

1. In accordance with the requirements of Section 01 34 00, Shop Drawing Procedures, provide, as part of the second shop drawing submittal, a detailed list of spare parts with specific models and quantities denoted unique for the Seller to be provided under this Contract for approval by the ENGINEER.

**PART 2 -- PRODUCTS – (NOT USED)**

**PART 3 -- EXECUTION – (NOT USED)**

# SPARE PARTS LIST

1. Diaphragm Pumps
    a. Provide one shelf spare pump for each separate pump type, size, or material provided.
2. Vertical Inline Centrifugal Booster Pumps
    a. Provide 2 sets of spare mechanical seals of each size.
    b. Provide one shelf spare for each pump type, including:
        1) CIP Circulation Pump
        2) CIP Drain Pump
        3) Neutralization Drain Pump
3. Horizontal End Suction Pumps
    a. Provide 1 spare mechanical seal per pump or a maximum of two mechanical seals of each type.
    b. Provide 1 complete spare acid CIP pump including baseplate, motor coupling and pump and any ancillary component equipment, if the pump is installed in a single stand-alone configuration.
    c. Provide 1 complete spare caustic CIP pump including baseplate, motor coupling and pump and any ancillary component equipment, if the pump is installed in a single stand-alone configuration.
4. Compressed Air System
    a. For each compressor
        1) 2 sets of replacement compressor intake filters for each compressor
        2) 2 sets of replacement oil filters
        3) 15-gallons of oil
    b. For the compressed air system
        1) 1 pressure regulator for each type supplied
        2) 1 pressure relief valve for each type supplied
        3) 1 automatic drain valve for each type supplied
        4) Process Air Filters - 2 replaceable filter element for each filter supplied

5. Programmable Logic Control Equipment
    a. Provide 1 spare card PLC or Fieldbus module of each type including
        1) CPU Modules
        2) Network / Communication Modules
        3) Discrete Input / Output Cards
        4) Analog Input / Output Cards
        5) Foundation Fieldbus Interface
6. Process Instrumentation General Requirements and Switches
    a. Provide 1 spare for each type, size, and material
        1) Level Switches- Tank Sidewall Mounted
        2) Level Switches – Float Style
        3) Flow Indicating Vane Switches
        4) Flow Switches
        5) Pressure Switches
        6) Pressure Diaphragm Seals
7. Process Instrumentation Meters and Transmitters
    a. Provide 1 spare for each type or range
        1) Level Transmitters
        2) Low-Flow Flowmeter with Controller
        3) Flowmeters Provide one spare for each size used
        4) Temperature Sensors
    b. Provide 2 spares for each type or range
        1) Pressure Gauges (I-001)
        2) Rotameter
        3) Pressure Transmitters
8. Process Instrumentation Analyzers:

a. Turbidity Meter

1) Provide 1 calibration kit

b. pH Analyzers

1) Provide 2 spare probes

c. ORP Analyzer

1) Provide 2 spare probes

d. Conductivity

1) Provide 2 spare probes

9. Control Panels, Enclosures, and Panel Instruments

a. Provide spare quantities of the following:

1) 6 spare bulbs for each type of bulb used in the control system.

2) 6 spare fuses for each type and size of fuse used in the control system.

3) 3 spare control relays of each type used in the control system.

4) 1 spare type of each signal conditioner (isolator, adder-subtractor, etc.) of each type used in the control system.

10. Ball Valves, Butterfly Valves, Section, Check Valves, Specialty Valves and Valve Actuators

a. If more than 3 valves of any type or kind are provided, the Seller will supply a valve or valve actuator of each size and type used.

b. Butterfly Valves

1) Valve Seats - 2 for each valve size

c. Valve Actuators

1) Seal Kit, for Type Modulating Actuators – Two for each actuator size.

END OF SECTION

# SECTION 11 30 00 – CONTAINERIZED HOLLOW FIBER MEMBRANE EQUIPMENT MEMBRANE TREATMENT SYSTEM

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. This Section specifies the requirements for the design and fabrication of a containerized or trailer mounted membrane filtration (MF) treatment system. It describes the work to be performed by both the MF equipment manufacturer (Seller) to supply containerized membrane treatment systems to the City of Sandy (City) for future installation at the Alder Creek WTP (WTP). The WTP shall have 2 mgd firm capacity.

2. This Specification covers the containerized membrane filtration (MF) treatment system consisting of feed pumps, strainers, membrane filtration units, membrane cleaning and neutralization systems, membrane backwash pumps, excess feed recirculation equipment (if deemed necessary by the Seller for the operation of their system), air supply systems, piping, valves, controls and instrumentation for the complete system.

3. Additive Bid Item. If any container is not completely filled to meet the firm design capacity of 2 mgd, Seller should provide the additional cost for providing full buildout of all required containers. The purposed may be to increase capacity, lower the overall flux rate, or implement future backwash recycle.

4. The Special Engineering Services are to be provided under this contract and include project related activities including: shop drawings submittals and other engineering services.

5. The Special Services are provided under this contract and include project related activities including: O&M manuals, installation, commissioning and acceptance testing field services and operator training necessary for the installation of the System as described within the Contract Documents.

B. Reference Specifications

1. Section 01 08 00, Identification and Tagging

2. Section 01 33 17, Structural Design, Support and Attachment

3. Section 01 34 00, Shop Drawing Procedures

4. Section 01 61 00, Transportation and Handling of Goods

5. Section 01 61 10, Protection of Goods

6. Section 01 62 00, Installation of Membrane Equipment

7. Section 01 66 00, Commissioning of Membrane Equipment

8. Section 01 67 00, Acceptance Testing of Membrane Equipment

9. Section 01 73 00, Installation, Operation and Maintenance Manuals

10. Section 01 74 00, Membrane System and Module Warranty

C. Coordination

1. The design of a membrane filtration system requires considerable coordination between the Buyer, Engineer and Seller. The Seller will provide assistance to the Engineer and Buyer and provide the information needed to coordinate the design of the membrane filtration system and the ancillary equipment designed by the Engineer but not provided by the Seller.

2. The Seller shall provide all parts, equipment, materials, and components including instrumentation and controls. Equipment will be installed and interconnections made by the Contractor under a separate installation contract.

3. The Contractor shall be responsible for installation of equipment furnished under a separate contract and for provision of interconnecting piping and electrical power supply and connections. The Contractor shall assume responsibility for the satisfactory installation of the MF system. Upon completion of system installation will be reviewed and a Notice of Completed Installation shall be issued.

D. Special Considerations

1. Definitions

a. Seller: Containerized Membrane Filtration System Manufacturer

b. Hollow Fiber Membrane: an engineered self-supporting non-woven porous media of polymeric material with an outside diameter of 0.2 to 2.0 mm and an absolute pore size of less than 0.5 micron. Absolute pore size is defined as obtaining greater than 6-log removal (99.9999 percent) of particles or microorganisms of a known size.

c. The Containerized Membrane System pertains to the fiber membrane filtration equipment. The System shall contain at a minimum the following components:

1) 2 Membrane Units

2) Cleaning system

3) Compressed air system

4) Backwash tank and pump

5) Feed pumps and automatically backwashing strainers

6) HVAC system

7) Controls system

d. Air Scrub (AS) – Use of air during backwashing to dislodge contaminants from the membrane module.

e. Backwash - The periodic reversal of flow through a filter which may be accompanied by water in conjunction with air or oxidants at a low concentration (less than 10 mg/L of total chlorine) generally associated with the intermittent waste stream from an ultrafiltration or microfiltration membrane system used to remove particulate matter. Same as Reverse Filtration or Backpulse.

f. Container – The structure that houses the containerized membrane system shall be a shipping container or shipping trailer able to be placed by crane or truck, manufactured of corten steel and contain all system components integral to the containerized unit described in this specification.

g. Chemical Washing / Maintenance Cleaning - The periodic application of a concentrated chemical solution at high concentration (i.e. more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10) to the membrane for a short duration of time (two times per day maximum for a total duration of less than 60 minutes) for the intended purpose of maintaining membrane permeability or reducing membrane fouling by a factor of less than 33 percent of the total amount of fouling that may be observed by the membrane.

h. Clean In Place - The periodic application of a concentrated chemical solution at high concentration (i.e. more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10, or a surfactant or enzymatic cleaning agent) a membrane for an extended, duration of time (more than 60 minutes per day) for the intended purpose of reducing membrane fouling by a factor of more than 33 percent of the total amount of fouling that may be observed by the membrane.

i. Module - A membrane module is a complete unit composed of the membrane fibers, a housing, feed inlet, and filtrate outlet.

j. Train - A group of membrane modules arranged together and that share common feed and filtrate piping. Modules arranged such that the following are performed on all modules in a Train (Backwash, Clean In Place Chemical washing / Maintenance Clean)

k. Unit - The water production entity of a membrane system. A unit consists of a number of membrane modules that share feed and filtrate valving, and the units can usually be isolated from the rest of the system for testing, cleaning, or repair. Also called racks, trains (in conflict with the above definition), or skids

2. Design or Performance Requirements

a. It is the intent of this Specification and the Drawings to identify major components of the System and to establish minimum equipment and quality standards for these components. It is the Seller’s responsibility to provide all parts, equipment, materials, and components required for a complete and functional System.

b. Acceptable Sellers: Based on the Buyer's review, the following MSS's have demonstrated competent and are accepted by the Buyer to propose on this project:

1) PALL Water

~~2) WesTech~~ [Addendum #1]

3) H2O Innovation

c. Based on the Buyer's review, the following membrane modules and membrane element manufacturers are pre-qualified are accepted by the Buyer:

1) PALL (ASAHI) UNA-620A Microfiltration Membrane Module

2) Toray HFUG2020AN Ultrafiltration Membrane Module

~~3) DuPont IntegraTec XP 77 IG~~ [Addendum #1]

4) Membrane modules shall be positive-pressure type, PVDF hollow fiber construction, using an outside-in flow path. The membrane shall nominal pore size shall not exceed 0.1 micron.

3. Alternatives:

a. Alternative Sellers, Membrane Element Manufacturers, and membrane modules will not be considered.

4. Drawings:

a. The Seller shall furnish all components identified on the Drawings and as specified in this Section. If an item is shown to be furnished by either the Drawings or the Specifications, it shall by furnished whether or not shown on both.

b. The Seller shall furnish all components for complete and operatable containerized systems. The scope of supply is as follows:

1) Membrane containers (includes steel supports, HVAC, insulation, and piping within container)

2) Membrane modules

3) Feed pumps

4) Automatically backwashing strainers

5) Backwash pumps

6) Control and isolation valves

7) Clean-in-Place equipment for each containerized membrane system

8) Compressed air systems

9) Feed and filtrate turbidimeters

10) Backwash supply tanks

11) Electrical panels

12) Variable Frequency Drives for feed, backwash, and CIP pumps

13) Custom programming and components as needed to interface with plant feed and finished water equipment, as well as existing process equipment.

14) Start-up and training services

15) All other appurtenances listed herein, as required or shown on the drawings

c. The Seller is responsible for monitoring and controlling the MF System and other equipment shown on the Process and Instrumentation drawings and for interfacing any other plant controls or systems identified.

d. The MSS's shall supply a remote monitoring system, which combines early detection of any issues that may arise, system optimization, remote troubleshooting and accessibility of systems, and common data storage all into one, simple platform.

e. Drawings have been prepared for the purpose of obtaining a Proposal for the supply of goods and special services and are presented as a suggested system layout. Exact system details may differ per manufacturer.

f. The equipment type shall be reviewed by the Seller to assure that it satisfies the minimum requirements deemed appropriate for the intended service.

g. Final pipe sizing shall be by the Seller during detailed design after the Seller has been selected.

h. The Seller shall review equipment and line sizing for equipment that is to be provided by the Seller for consistency with their particular process.

i. General Systems Drawings are shown on I-001 to I-007. These drawings may differ from the installed system depending on the selected Seller. Systems integral to each containerized unit such as the backwash system and CIP system are not shown but included in the scope of supply by the Seller.

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC)

A. Manufacturer's Qualifications: All equipment furnished under this specification shall be new and shall be the standard product of a manufacturer who is fully experienced, reputable, qualified and regularly engaged for at least 5 years in the manufacture of the equipment to be furnished.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. American Society of Mechanical Engineers (ASME)

    a. ASME Boiler and Pressure Vessel Code

2. American Society for Testing and Materials (ASTM)

    a. ASTM A 193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

    b. ASTM A 36, Standard Specification for Structural Steel

3. American National Standards Institute (ANSI)

    a. ANSI B16.5 - Pipe Flanges and Flanged Fittings

    b. AWS D1O.9, Standard for Qualification of Welding Procedures and Welders for Piping and Tubing

4. American Welding Society (AWS)

    a. AWS A5.9 - Specification for Bare Stainless Steel Welding Electrodes and Rods

    b. AWS D1.1 - Structural Welding Code - Steel

    c. AWS D1O.9 - Standard for Qualification of Welding Procedures and Welders for Piping and Tubing

5. CSA W47.1 and W59 (Canadian Welding Standard) [Addendum #5]

6. Institute of Electrical and Electronic Engineers (IEEE)

7. National Electric Code (NEC) National Electrical

8. Manufacturers Association (NEMA)

9. Standards of National Electrical Manufacturers Association

10. Standards of American Water Works Association (AWWA)

11. National Electric Code (NEC)

12. National Sanitation Foundation (NSF)

C. Manufacturer's Quality Assurance/Quality Control Program

1. The manufacturer shall have in place a dedicated quality control/quality Assurance program.

1.03 SUBMITTALS

A. Shop Drawings

1. Coordination Meetings

a. Within fourteen 14 days after execution of the Agreement, the Seller shall meet with the Engineer at the Engineer's location to address any issues related to the project. The Seller shall prepare and submit a project specific process and instrumentation diagram (P&ID) of the proposed containerized membrane systems, and neutralization system for discussion.

2. Drawings and Samples:

Clarification: 3D drawings will be provided as STEP or DWG files. Consultant shall confirm if Revit can import these formats

a. The Seller shall submit for review and approval in accordance with the Shop Drawing Procedures the following First Shop Drawing Submittals in accordance with Section 01 34 00, Shop Drawing Procedures. All drawings shall be submitted electronically in pdf format. Electronic drawings shall also be submitted in 3-D format compatible with the Revit design model. The Seller shall submit the following information:

1) Schematics Drawings:

a) P&IDs of the System, including hydraulic and pneumatic schematics detailing the equipment supplied by the Seller and showing equipment provided by others that will interface with the System.

b) Provide a P&ID of a typical membrane unit including hydraulic and pneumatic schematics detailing the equipment supplied by the Seller.

c) The Engineer, Buyer and Seller are responsible for establishing the P&ID tag numbering for the units and the system. The identification and tag numbering shall be in accordance with Section 01 08 00, Identification and Tagging.

d) Electrical schematic diagrams including motor horsepower and other electrical load information and identification of external wiring (panel) connections and for coordination with the Contractor supplied VFDs.

2) Containerized System Drawings: The Seller shall coordinate production and submit each of the following Arrangement drawings for approval:

a) Provide plan and elevation views of containerized membrane system and all equipment to be included in container.

b) Clearly identify the termination points and physical location for hydraulic, pneumatic and electrical connections where interfacing of the Seller supplied equipment and equipment to be installed by the Contractor exists

c) Once submitted and approved the "physical envelope" of the Seller supplied equipment or termination points shall not change without approval of the Engineer

d) A bill of materials for all tagged devices and components supplied with the Unit including component original part numbers identifying each furnished component

3) Containerized Neutralization System Drawings: The Seller shall coordinate production and submit each of the following Arrangement drawings for approval:

Clarification: CIP neutralization system is supplied within UF containers, so no separate neutralization system

a) Provide plan and elevation views of skid mounted neutralization system. The CIP tank does not need to be mounted on the skid, it will be shipped loose for installation and connection to the Neutralization skid by the contractor.

b) Clearly identify the termination points and physical location for hydraulic, pneumatic and electrical connections where interfacing of the Seller supplied equipment and equipment to be installed by the Contractor exists

c) Once submitted and approved the “physical envelope” of the Seller supplied equipment or termination points shall not change without approval of the Engineer

d) A bill of materials for all tagged devices and components supplied with the Unit including component original part numbers identifying each furnished component

4) The Seller shall attend a meeting with the Buyer within 10 days after the submittal of the first shop drawing for coordination and review.

b. The Seller shall submit for review and approval in accordance with Section 01 34 00, Shop Drawing Procedures.

1) Manufacturer’s literature, illustrations, specifications, weights, pump curves, and engineering data for project engineered equipment including dimensions, materials, sizes, and performance data.

2) Piping Fabrication and Assembly Drawings: For all MF system piping, provide double-line scaled drawings showing all fittings, valves, instruments and supports.

a) Provide fabrication details for piping and structures elevation views of all major components and subsystems, detailing orientation of equipment, piping, fittings and valves (including valve actuators).

Clarification: offer is based on piping identified in P&ID set

b) Identify piping materials and fabrication details as required by Section 15 06 20, Stainless Steel Pipe and Tubing.

c) Each support shall be identified by catalog number or shop drawing detail number.

3) Containerized membrane system:

a) A bill of materials for all tagged devices and components supplied with the containerized membrane system including component original part numbers identifying each furnished component. For all tagged devices supplied, the Seller shall develop a “Cross Reference Schedule” that matches the Tag to the appropriate equipment manual. The equipment schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range. The Cross-Reference Schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

4) Design Calculation:

a) Design calculations related to sizing of key components, including the overall System, pumps, valves, Units, process air system, backwash system, CIP system, chemical transfer pumps, CIP pumps, and electrical controls and instrumentation supplied by the Seller. Calculations for the piping system shall be sufficient to demonstrate that the system is hydraulically stable (balanced) under normal and backwash operation within the Seller’s and/or good engineering practice limits. Submittals for pump(s) and throttling and modulating valve(s) shall also include calculations to show that cavitation does not occur over the intended minimum and maximum operating range.

b) Other submittals and/or shop drawings as required under the Contract Documents

c) Submit data as required by the applicable components of Section 11 00 00, General Equipment Provisions.

5) Information as specifically requested by the Engineer or Buyer in support of this Project.

6) The Seller shall attend a meeting with the Buyer within 10 days after the submittal of the second shop drawing for coordination and review.

B. Factory Test Reports

1. Quality Control Reports

a. Factory Test and Seller Quality Control Reports for all equipment provided including the Factory Test Report for the PLC/HMI system functional performance test reports

b. Factory Test Reports for all Control Panels

C. Installation Instructions: Refer to Section 01 62 00, Installation of Membrane Equipment.

D. Commissioning Plan: Refer to Section 01 66 00, Commissioning of Membrane Equipment.

E. Operation and Maintenance Manuals: Refer to Section 01 73 00, Installation, Operation and Maintenance Manuals.

F. Training Manuals: Refer to Section 01 73 10, Training of Operations and Maintenance Personnel.

G. Record Drawings: In accordance with Section 01 73 00, Installation, Operation and Maintenance Manuals, after completion of Acceptance Testing the Seller shall revise and submit to the Buyer revised O&M Manuals using As Installed information.

H. Certificates, Warranties and Guarantees

1. Refer to Section 01 74 00, Membrane System and Module Warranty

2. Seller “Acceptance of Installation” following equipment installation.

3. Regulatory Agencies: The Seller shall supply hydraulic calculations and drawings for the System and any other system performance data specifically required by regulatory agencies.

**PART 2 -- PRODUCTS**

2.01 SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS

Clarification: will be provided with 2 sets of duplex chemical transfer pump systems, 2 sets of duplex dosing systems, & chemical day tanks for each. More information on scope of supply in appendix L P&IDs

A. Process Description

1. The Alder Creek Raw Water Pump Station (RWPS) intake pumps will provide source water for treatment. The feed stream will receive chemical addition by aluminum chlorohydrate coagulant, sodium hypochlorite (optional), and sodium hydroxide followed by mixing and storage in the membrane filtration feed tank. These system components can be found on Drawing I-004.

2. Process and Instrumentation Drawings (P&IDs) for the membrane filtration system including the associated chemical feed systems have been developed to detail the equipment to be provided. The Drawings have legend sheets that describe the symbols and abbreviations used on the P&IDs.

3. The requirements for the equipment type are cross-referenced in the specifications. The equipment type identified should be reviewed by the Seller to assure that it satisfies the minimum requirements deemed appropriate for the intended service.

4. The feed stream shown on Drawing I-001 may have undergone pre-treatment via coagulation and chlorination and pH control prior to entering the membrane feed tank. Flow from the feed tank will be split between one of two or three containerized membrane systems, as determined by the containerized system capacity.

5. Membrane feed pumps (located inside each containerized unit) will discharge water through automatically backwashing strainers and to the membrane filtration units, both located within the containerized unit.

6. Feed pressure will be used to backwash the automatic backwashing strainers. The feed system is controlled using the pressure transmitter located downstream of the strainers. Backwash flow from the strainers will be measured and routed to a manhole where it combines with other waste streams and then discharged to existing backwash ponds. Clarified water from the backwash ponds is not expected to be recycled to the head of the WTP at the time of installation of the containerized units but may be recycled in the future.

7. A spare or standby membrane filtration rack will provide redundancy to the membrane to achieve an (N+1) system design. A rack is considered redundant if it has the following components:

   a. Dedicated feed pump

   b. Dedicated strainer

Clarification: offer is based on having design, supply, and installation of all pipework and wiring not by H20 Innovation

8. Drawing I-002 shows the arrangement of interconnecting piping for the containerized membrane treatment units. Note that the design of the interconnecting piping is to be prepared by the Seller.

9. The feed shall be designed with an air/vacuum relief located at the highest point of the membrane unit to relieve air that may have accumulated during the air scour sequence or relieve vacuum conditions during draining of the unit. Prior to discharge, the filtrate flow is measured and the turbidity is also monitored.

10. The common filtrate discharge pipe will have chemical addition for disinfection and pH control. Filtrate discharge piping and pH control equipment will be supplied by the contractor. pH control equipment will be supplied by the plant control system and does not need to be controlled by the Sellers equipment.

11. The filtrate will enter a chlorine contact tank that will be constantly full and then will discharge to distribution through a high service pump station.

12. Water for backwashing membrane modules should be supplied by filtered water produced by the containerized units. Each containerized unit should be equipped with a filtrate tank to provide water for backwashing. The backwash pumps will be driven by VFDs for flow control.

13. The CIP system will be integral to each containerized unit and be supplied by the Seller including air diaphragm metering pumps and instrumentation for chemical addition during the CIP process.

Clarification: CIP neutralization system is supplied within UF containers, so no separate neutralization system

14. Spent cleaning and chemical maintenance cleaning waste are collected, pH-neutralized, and dechlorinated in the neutralization tank prior to discharge. The neutralization system is shown on Drawing I-004. The neutralization system, shall be skid mounted and all necessary equipment including pumps, instrumentation and the neutralization tank should be supplied by the Seller. Neutralized CIP waste solution will discharge to a holding tank at the WTP site. Neutralized chemical maintenance clean solution will discharge to the Backwash pond.

15. Citric Acid (50%) will be delivered in totes or drums, located outside of the containerized membrane systems, and will be transfer-pumped to the acid CIP tank or Neutralization tank as needed by pumps supplied by the Seller.

16. Sodium Hydroxide (25%) will be delivered in bulk and will be transfer-pumped to the Caustic CIP tank or Neutralization tank as needed as shown on Drawing I-005. Transfer pumps needed for containerized system operation to be provided by seller.

17. Sodium Hypochlorite (12.5%) will be delivered in bulk and will be transfer-pumped to the Caustic CIP tank as needed as shown on Drawing I-006. Transfer pumps needed for containerized system operation to be provided by seller.

18. Aluminum Chlorohydrate coagulant will be dosed to the raw water and equipped will be supplied by Contractor.

19. Calcium thiosulfate will be delivered in liquid form by 55 gal drums and will be transfer-pumped to the neutralization tank as needed as shown on Drawing I-004. Transfer pumps will be supplied by the Seller.

20. Each containerized system shall have a dedicated PLC or Remote I/O module(s) which shall report back to the centralized PLC. The seller shall also supply a master PLC to control communications between each trailer and the neutralization system.

Clarification: hot-swappable PLC systems have not been included

21. The master PLC shall be complete with a secondary standby, hot-swappable PLC system that shall be capable of taking over system operation in the event of a failure to the primary PLC.

22. A compressed air system shown will supply control air including air for daily integrity testing, air scour cleanings during backwash, pneumatically controlled valves, and supply any pressurized air required by the neutralization system. Each containerized unit will be equipped with a compressor, dryer, receiver and filters.

B. Service Conditions

1. Ambient Environment. The equipment furnished under this section will be installed at the locations shown on the Drawings. The site conditions are expected to be as follows:

   a. Ambient Air Temperatures: 25°F to 105°F

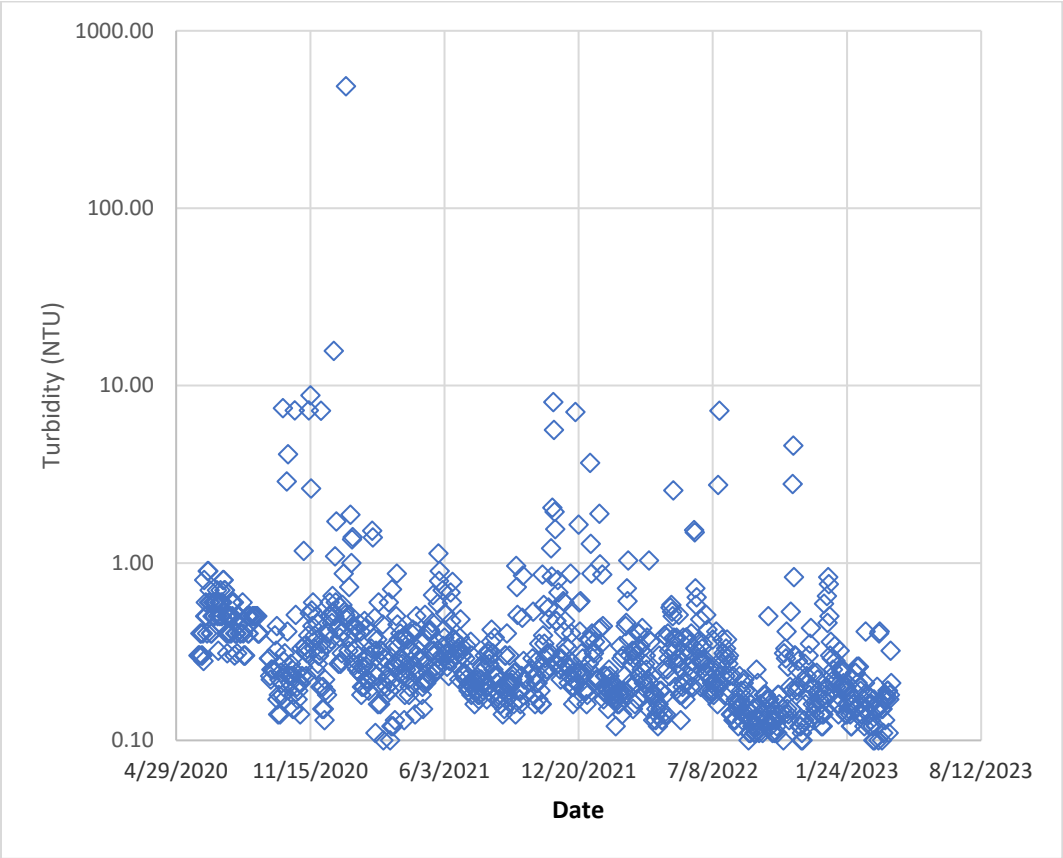
   b. Relative Humidity: 0 to 100 percent noncondensing

   c. Altitude: 1,078 feet above Mean Sea Level

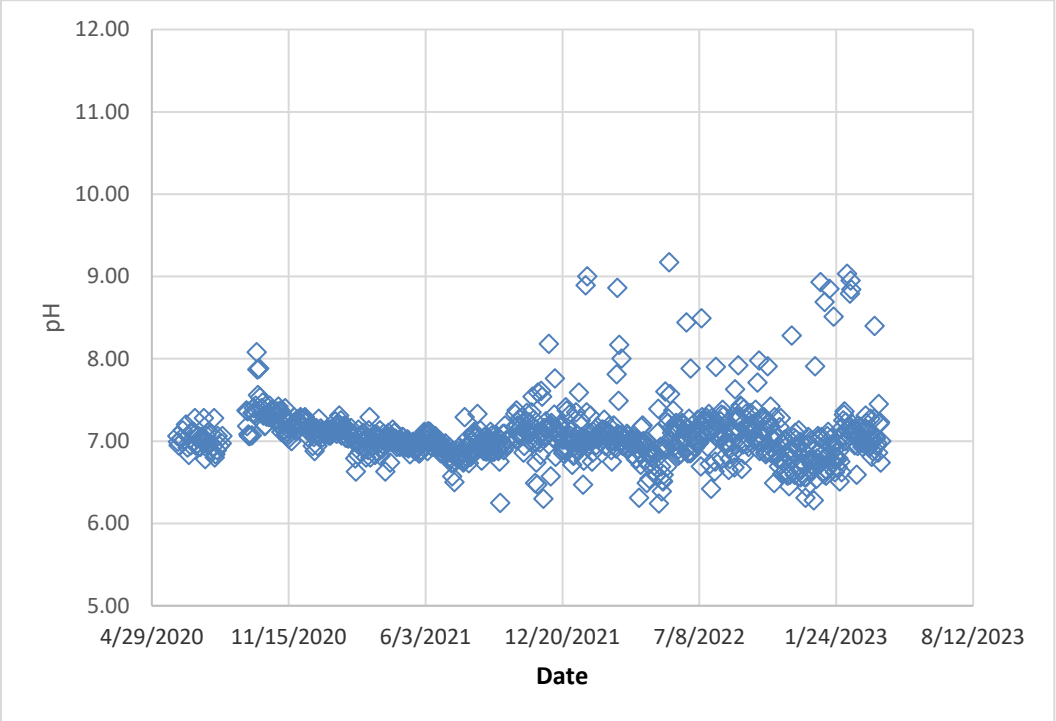
   d. Environment: Rural area west of the City of Sandy, approximately 38 percent sunny days, annual rainfall approximately 78 inches and winds up to 42 mph. ~~and potential for wildfire smoke~~. [Addendum #5]

2. Feedwater Quality: Historical Water Quality information is somewhat limited from the existing WTP but is as follows:

   a. Turbidity: Design shall assume a max of 20 NTU [Addendum #5]


1000.00
100.00
10.00
1.00
0.10
Turbidity (NTU)
4/29/2020
11/15/2020
6/3/2021
12/20/2021
7/8/2022
1/24/2023
8/12/2023
Date

b. pH


12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
pH
4/29/2020
11/15/2020
6/3/2021
12/20/2021
7/8/2022
1/24/2023
8/12/2023
Date

c. Raw water temperature: 5 deg C to 15 deg C

d. Additional sampling data was performed on 11/17/23 and is listed below:

1) Iron – non-detect

2) Manganese – non-detect

3) Alkalinity – 26 mg/L as $CaCO_3$

4) Total Organic Carbon – 0.63 mg/L

5) Ammonia – non-detect

6) Nitrate/Nitrate – Non-detect

7) Total Suspended Solids – non-detect

3. Process Design Requirements: Raw water will receive coagulant injection, mixing, with reaction time in the membrane feed storage tank. Sodium hypochlorite and sodium hydroxide and could be added to the raw water for disinfection, and pH increase.

4. Estimated design elevations to be refined during fnal design:

a. Process Inlet Water Level

1) ~1078.0 ft EL

b. Plant Site

1) ~1076.0 ft EL

c. Filter Discharge Water level

1) CT Tank High water level – ~1077.0 ft EL

C. Process Design Requirements

1. Overall System Design Philosophy

a. The facility consists of coagulation, feed tank storage reaction time, containerized membrane filtration systems (including feed pumps, automatically backwashing strainers, backwash, process air, CIP and provisions for chemical maintenance cleaning), a neutralization system, Chlorine disinfection, filtered water storage, and a high service pump station. Membrane backwash waste will be coagulated and sent to a solids holding pond. CIP waste shall be pH-neutralized, dechlorinated, and discharged to a holding tank for future disposal. Chemical maintenance cleaning waste shall be pH-neutralized, dechlorinated and discharged to the solids holding ponds.

b. The design philosophy for the facility is that the Seller shall provide enough containerized membrane systems to provide redundancy such that N+1 membrane racks are provided between all containerized units.

c. The membrane filtration system for the Alder Creek WTP shall be capable of producing 2.0 mgd of water (net) for drinking. The capacity shall be calculated using the net filtrate with one membrane rack out of service.

2. Membrane System Design Criteria: The Seller shall list guaranteed design and operating criteria. The selected Seller shall demonstrate the guaranteed design and operating criteria during a proof pilot test per Section 11 30 20, Performance Pilot Testing of Membrane Equipment. If design and operating criteria cannot be demonstrated, the Seller shall adjust the pilot test and full-scale system accordingly at no additional cost to the Buyer per Section 00 52 00, Procurement Agreement.

a. Membrane Flux:

1) The average membrane design flux shall not exceed 50 gfd instantaneous with one train out of service on the maximum day achieving the net filtrate capacities listed above. The flux shall be in units of gallons per day per square foot of membrane surface area using the feed side of the membrane.

b. Design Capacity and Design Temperature:

1) Design Capacity/Temperature

a) 2.0 mgd @ temperatures 5 deg C and greater

c. Number of Containerized Membrane Systems

1) Minimum: 2

d. For the purpose of determining membrane surface area required .and maintaining the provisions of membrane warranty for CIP interval, the maximum design capacity of 1.8 MGD for the membrane facility will not be adjusted for water temperatures above 5 deg C.

1) The Buyer may operate the membrane facility at any capacity up to the amount maximum permitted by the Oregon Health Authority or at 1.5 times the maximum presented turbidity conditions without invalidating the membrane warranty.

e. Excess Capacity / Redundancy:

f. Recovery: The system shall operate at or above the Seller's design recovery at all times during operation. Design recovery values shall be calculated as follows:

[Net filtered water (mgd)/Net feed (mgd)] x 100 percent

Clarification: recovery is calculated on per train basis averaged over 24 hours - no instantaneous calculations

Where the quantity: net filtered water (mgd) is equal to the total amount of filtered water produced (mgd) less any amount used for backwashing of the membrane filters (mgd) on a time weighted average. Net facility capacity is based on the amount of water discharged from the membrane minus water supplied to the backwash system. Net feed is the amount of water that enters the treatment facility. The facility capacity includes the amount of filtrate that is required for backwash and water that is used as part of a chemical maintenance cleaning process. Strainer losses or recovery of backwashing waste through clarification / recycle are not considered as part of the recovery calculation. Water used for CIP or CIP rinsing is not included in the calculation of recovery.

Minimum Recovery for Membrane System 95%

g. Minimum Chemical In Place Interval: 30 days*

* Refer to Section 01 74 00, Membrane System and Module Warranty for language regarding the criteria for Clean-in-Place interval

h. Minimum maintenance cleaning interval: 72 hrs frequency

i. Filtered Water Quality Requirements: Filtered water quality shall meet the following water quality requirements:

1) Turbidity

a) Maximum filtered water turbidity (ntu): 0.15

b) Maximum filtered water turbidity 95% of time (ntu): 0.10

2) Microbiological Removal Efficiency

a) Minimum *Giardia* Removal: >4-log (99.99 percent)

b) Minimum *Cryptosporidium* Removal: >4-log (99.99 percent)

## 2.02 EQUIPMENT DESIGN AND FABRICATION REQUIREMENTS

A. General System Requirements

1. The System shall be suitable for installation in an outdoor environment maintained between 25 degrees F and 105 degrees F.

2. Miscellaneous

a. Lifting Lugs: All equipment items or component assemblies weighing in excess of 100 pounds shall be furnished with lifting lugs.

b. Miscellaneous Fasteners: Bolts, nuts, washers, flange backing rings, and other miscellaneous metal components not specifically addressed elsewhere in these specifications shall be Type 316 stainless steel or ductile iron [Addendum #5].

c. Pumps, compressors and. Ancillary equipment shall be sized using the Seller design criteria established during pilot testing and will accommodate the maximum number of membrane modules per membrane unit assembly as indicated in the Proposal Pricing Form.

3. Cross Connection Control

a. The Seller shall design the membrane process with cross-connection control (block and bleed) to assure that chemical solutions used as part of a Chemical Maintenance Clean or Clean in Place process do not come in contract with raw or filtered water. Any chemical solution that does not fit the criteria defined as backwash shall be deemed as a cleaning solution. If a block and bleed system is not able to be installed within the container, the Seller shall include a block and bleed system to be installed at the filtrate connection of each container to be controlled by the containerized unit.

b. Any cleaning process, other than backwashing, must use a cross connection control strategy. Cross connection control shall be automated.

c. The cross-connection control strategy shall segregate the supply of the cleaning solution (chemical maintenance clean or Clean In Place solution) from the backwash solution.

d. The cross-connection control strategy shall isolate the individual membrane unit from the membrane train during the chemical maintenance clean or Clean in Place process. The cleaning solution shall be adequately rinsed from the membrane unit using raw or filtered water. Analytical instrumentation shall be used to confirm that the cleaning solution has been adequately rinsed.

e. The cross-connection control strategy shall be structured and interlocked such that the supply or discharge of cleaning chemicals remain segregated from the backwash.

f. If a common manifold is used for the delivery or discharge of two or more cleaning solutions, the common manifold shall be flushed and drained before a change in chemicals is made.

g. As a minimum, the cross-connection control strategy shall incorporate “double block and bleed” physical isolation for the filtrate for each containerized unit and at other locations as shown on the Drawings. Backwash supply shall be protected by a check valve located on the common line to the units.

4. Piping System Design

a. The Seller shall use piping materials that are suitable for the intended service inside the containerized units. “L” (Low carbon) grade 300 series stainless steel is required for welded pipe and fittings.

b. Rack Interconnecting Piping: Sch 80 PVC, HDPE, or 316 SS

c. All piping (including flanges), valves and components that comprise the permanent piping system on the membrane unit shall be pressure rated for a minimum of ~~150~~ 90 [Addendum #5] psi.

d. Unless stated otherwise or approved by the Engineer, a maximum fluid velocity of ~~10~~ 12 [Addendum #5] feet per second shall be used for the design of the pressure piping systems.

e. Unit piping shall be arranged in order to assure that a straight run of pipe is used for the flow meters. If not possible, the vendor shall use 0D (Zero Diameter) flow meters or submit a letter of acceptable use from manufacturer. For the purposes of determining the length of a straight run, the length is determined by the length of the spool piece of pipe used before or after the flow meter. Flow meter lay length shall comply with the flow meter manufactures installation requirements or have manufacturer acceptance of installed straight lengths. The flow from each Unit shall be measured directly or through addition or subtraction of two or more flow meters.

f. 2-1/2", 3-1/2" and 5" pipe sizes are not permitted unless approved in writing by the Engineer.

g. Unit piping of 1-inch or less in diameter may utilize SCH 80 PVC or a suitable material.

h. Tubing and other wetted sensing lines shall use type 316 Stainless Steel or poly tubing.

5. Pneumatic System:

~~a. When used, pneumatic solenoid valves shall have a pilot indicator and a manual override~~ [Addendum #5].

b. Pneumatic lines shall be of 304 or 316 stainless steel, HDPE, or polyurethane construction.

c. Plastic valves, check valves and other appurtenances are not permitted on compressed air lines.

d. Seller shall install flow controls as required to regulate valve actuation in order to prevent hydraulic shock.

e. The inlet to the membrane unit process shall include a check valve to prevent contamination of the air supply if compressed air is in direct contact with water [Addendum #5].

6. The Seller shall submit calculations to the Engineer that verify that valve or pump cavitation does not occur over the intended operating range. Seller may submit full wet FAT testing in lieu of calculations [Addendum #5].

B. System Design Requirements

1. P&IDs for each system have been developed. The purpose of these Drawings is to provide the Seller information for the project and define the scope of equipment to be provided. Equipment and appurtenances not specifically shown on these Drawings but required for operation of the system shall be provided by the Seller.

2. The P&IDs show the process design intent for the project and provides the necessary equipment, valves, and instrument necessary to control the process based on the MF Pilot Testing.

   a. The proprietary control is not shown on the drawings and is to be developed by the Seller in accordance with the Contract Requirements. The Seller is solely responsible for establishing the control of the MF System shown on the P&IDs and for interfacing with the plant control system.

Clarification: P&IDs will be supplied in H20 Innovation's standard format, not three-layer format

   b. The Seller shall develop P&IDs using the three-layer format identifying all I/O (analog discrete and digital) at the PLC and HMI levels as shown on the Drawings. Refer to Drawing PI-3 for the minimum typical instrumentation and control requirements. PLC and HMI operations shall be indicated on the Seller drawings and include ranges, alarms, set-points, control, primary interlocks and trending functions detailed at a sufficient level of indicate the intended operation of the system.

   c. Typical P&ID drawings will only be accepted for identical membrane filtration units.

3. Membrane Filtration Units

   a. Each unit shall consist of hollow fiber membrane modules.

   b. The modules shall be connected in manifolded blocks and supported by the MF unit framework. Modules for each block shall be tested at the factory.

   c. Each containerized system shall be provided with horizontal end suction pumps.

   d. The membrane modules shall be supported by a steel framework in a vertical orientation. The modules shall be connected to their manifolds with Victaulic and slip joint connectors. All seals shall be EPDM.

   e. Each containerized system shall be divided into identical Units. Identical consists of functionally independent (independent electrical and hydraulic control), and of the same hydraulic capacity. Differences in what appears to be unit symmetry (hand) are not acceptable. Each membrane, including the spare, shall be of identical design and shall accommodate the same maximum number of membrane modules. The spare shall be equipped with the same number of modules as the primary membrane units.

   f. Functionally independent means that each membrane unit shall be capable of independent operation for its process sequences upon initiation. It is not acceptable 1) to share valves or instrumentation that perform similar internal functions between membrane units or 2) require that all membrane units be removed from normal filtration and backwashing to perform a function or sequence.

g. Unit support frames shall be designed to resist gravity and seismic forces of the pressure vessels, piping and other related equipment supported by the frame. These supported items shall not be considered as structural members of the support frame. The frame shall be designed in conformance with the latest edition of the International Building Code (IBC) design criteria per Section 01 33 17, Structural Design, Support, and Attachment, and signed by a Registered Professional Structural Engineer currently licensed in the State of Oregon.

4. Backwash and Air Scrub (AS) System:

   a. The backwash system shall be designed for the number of membrane Units, as shown on the Drawings. General Requirements for the backwash System are as follows:

      1) Spent backwash water exiting the Unit shall be discharged in a controlled manner. Intermittent backwashes will be discharged to the solids handling ponds.

      2) The backwash sequence shall be designed so that the same volume (amount of water in gallons) of backwash water is produced per Unit backwash irrespective of the degree of membrane fouling (resistivity or permeability) or variation in water temperature (viscosity effect).

      3) Control programming shall be configured with appropriate software time delays to avoid rapid pump or membrane flow cycling in response to transient dynamic hydraulic effects caused by backwash; or chemical maintenance cleaning cycles. “Deadheading” or any operation of any pump under a “zero-flow” or “flow condition below the pump manufacturers acceptable limits” is not acceptable. Interlocks shall be provided to prevent operation of the any pump under a “dead-headed” condition.

      4) The MF units shall utilize a reverse flow back flush (backwash) to remove accumulated particulates and maintain the design filtrate production rate. Filtrate shall be introduced into the filtrate side of the fibers flushing dislodged solids to waste.

      5) The units shall incorporate an AS sequence to periodically agitate the exterior fiber surface. Dislodged solids shall be diverted to waste.

      6) The backwash and AS cycles shall be initiated through the process control system using totalized volume. The backwash and AS processes shall be carried out automatically through the PLC.

      7) The compressed air system supplying low-pressure air for the AS cycle will be provided by the Seller and integral to each containerized membrane system.

5. Clean-In-Place (CIP) and Chemical Maintenance Clean (MC)

a. Each containerized membrane system shall be provided with a CIP tank and accessories. The CIP system will include a CIP circulation pump, a CIP drain pump, valving, and instrumentation as shown on the Drawings. Circulation and drain pumping can be performed by one pump if suggested by manufacturer. A single pump shall be installed in each containerized unit with one shelf spare provided for the project.

b. The Seller shall supply equipment and appurtenances as shown on the P&ID Drawings.

c. There shall be a shared tank for acid and caustic CIP solutions. The system shall include accessories, tank heater control panel, heaters and controls, and analyzers as shown on the Drawings.

d. Spent CIP solution shall be discharged in a controlled manner. Intermittent CIP solutions will be discharged to the neutralization tank for pH-neutralization, dechlorination, and equalization. The neutralization system shall include a neutralized waste pump that can be used to mix the tank contents or discharge the tank contents to either the ~~sanitary sewer~~ CIP waste holding tank [Addendum #5] for CIP wastes or the solids drying beds for maintenance clean wastes.

e. There will be one citric acid dose transfer system, one sodium hydroxide transfer system, and one sodium hypochlorite transfer system provided to supply concentrated chemicals to the CIP tanks.

f. Heaters shall be provided for heating of CIP solutions. The heaters shall be sized to elevate the water temperature to the desired level and maintain the temperature during the CIP cycle. Heaters shall meet the following requirements:

| | |
|---|---|
| General | Heater with thermocouple, Type K, NEMA 4X |
| Sheath | Incology 800 / Titanium |
| Flange | 304 SS |
| Gasket | Fiber |
| Seal type | Epoxy |
| Power requirements | 460 V, 3 ph, 60 Hz |
| Minimum energy demand (kW) | ~~80~~ 18 [Addendum #5] |

g. Recommended Manufacturers for Tank Heaters:

1) Indeeco, or approved equal.

h. Seller shall provide the necessary interlocking logic to assure that a Unit being chemically cleaned is isolated from the MF System as shown on the P&ID Drawings.

i. The design of the chemical cleaning system shall incorporate automatic safety features to assure that cleaning solution is adequately rinsed from the MF System and will not contact filtered water.

j. When not in operation, each Unit shall be capable of being stored in a CIP solution or other suitable storage solution.

k. The cleaning pumps shall be vertical in-line or horizontal end-suction [Addendum #5] centrifugal type.

Clarification: pumps will be pneumatically driven air diaphragm/ solenoid driven chemical metering pumps

6. Chemical Maintenance Clean (MC)

a. General: The maintenance clean system will utilize the CIP system described above with similar control system requirements.

1) The Seller shall provide the chemical transfer and solution mixing equipment and controls to batch the maintenance clean solution that is used for chemical cleaning of the Units as shown on the P&ID Drawings.

2) Spent maintenance cleaning solution shall be discharged in a controlled manner. Intermittent chemical cleaning solutions will be discharged to the CIP neutralization system and then to the solids drying bed.

Clarification: H2O Innovation does not rely on heated MCs

3) Heaters shall be provided for heating of maintenance cleaning solutions. The heaters shall be sized to elevate the water temperature to the desired level and maintain the temperature during the maintenance clean cycle. Heaters shall meet the same requirements mention above for the CIP system.

4) The Seller shall provide the necessary interlocking logic to assure that a Unit being cleaned is isolated from the MF System as shown on the P&ID Drawings.

5) The design of the chemical cleaning system shall incorporate automatic safety features to assure that cleaning solution is adequately rinsed from the MF System and will not contact filtered water.

7. Each containerized system shall be equipped a Membrane Filtrate Monitoring System consisting of a Membrane Filtrate Sample System and a Membrane Integrity Test System.

a. Membrane Filtrate Sampling System

1) An automatic sample valve located on the filtrate (permeate) discharge line on each membrane rack.

2) The sample valve shall open when the unit is producing water. The sample line shall be connected to a turbidity meter provided by the Seller. Power for the turbidity meter will be sourced from the Unit control panel. The analog signal from the turbidity meter shall be routed into the Unit PLC or Remote I/O.

3) An automatic sample valve located on the common filtrate (permeate) discharge line connecting each containerized unit and provided by the Contractor.

b. Membrane Integrity Test system to verify the integrity of membrane modules:

1) The membrane integrity test system shall use air pressure to verify the integrity of the membranes.

2) The applied test pressure of the membrane integrity test system shall be established so that passage of particles greater than 3.0 microns or larger can be detected.

3) The un-pressurized side of the membrane unit will be vented to atmospheric pressure.

4) The Seller shall provide documentation of methodology used to establish the integrity test pressure.

5) The integrity test system shall be manually or automatically initiated and automatically sequenced by the PLC system, and complete daily in conformance with the US EPA Long Term 2 Enhance Surface Water Treatment Rule and the Membrane Filtration Guidance Manual.

6) The integrity test system shall verify the integrity of the membrane and upon successful completion of the integrity verification, return the Unit to service.

7) If the integrity test does not pass the integrity verification, the Unit shall be removed from service and an alarm shall be annunciated from the Unit PLC / Remote I/O to the System PLC.

8) Refer to Section 01 74 00, Membrane System and Module Warranty for additional requirements of the Membrane Integrity Test System.

C. Fabrication Requirements

1. All welding shall be in accordance with the latest applicable codes of the American Welding Society, CSA [Addendum #5] codes, and/or ASME Boiler Code.

2. Piping

a. Schedule 10S Type 316L stainless steel pipe assemblies may be used.

b. Refer to Section 15 06 20, Stainless Steel Pipe and Tubing for stainless steel fabrication.

c. Threaded fittings shall not be used for pipe diameters exceeding 2 inches IPS.

d. Each membrane valve or piping assembly shall be tested at the Seller's facility using dummy module. This testing shall incorporate a leak check to verify the integrity of the welded and bolted connections and will be repeated in the field using the actual modules. If the Seller elects to forgo this test and a weld failure is discovered during the field rest, the Seller shall be responsible for all costs associated with the requisite repairs and associated delays.

3. Unit Frame Construction

a. The unit support frames and miscellaneous brackets shall be fabricated from ASTM A36 hot rolled steel structural members and ASTM-A500, Grade B welded steel structural tubing.

1) The method of fabrication shall be continuous fillet and bevel welds. The strength of these welds shall meet or exceed the strength of the structural shape or tubing material. All welding operators shall be qualified in accordance with the current AWS or CSA W47.1/W59 [Addendum #5] requirements. All exterior welds shall be ground flush and smooth prior to sandblasting. Metal Inert Gas (MIG) welding techniques shall not be used in the frame fabrication. Stitch and spot welding will not be accepted. Bolt holes, mounting holes, etc., shall be drilled prior to painting wherever possible.

b. Painting

1) ~~Refer to Section 09 90 00, Painting~~ painting to compy with Seller recommendations and requirements [Addendum #5].

## 2.03 EQUIPMENT AND COMPONENTS

A. Component Equipment Requirements

1. Component equipment provided by the Seller shall conform to the requirements of the Contract Documents.

Exception: offer is based on non-certified NSF-61 piping, but many components have 316SS construction and are NSF-61 compatible

2. The Seller may use NSF / FDA / USDA approved plastic material for module assemblies that are replaced with the membrane modules. All materials of construction shall use NSF / FDA / USDA approved materials for contact with water.

3. Centrifugal Pumps

a. Process Design Requirements

1) Pump sizing and calculations shall be finalized with submittal drawings for the membrane system.

2) Pumps shall be sized using the Seller design criteria and will accommodate the maximum number of membrane modules per membrane unit assembly as indicated in the Proposal Pricing Form.

b. Service Condition

1) Membrane feed pumps

2) Backwash pumps

3) CIP recirculation pump

c. Design Criteria

1) Process Design Requirements

a) Pump sizing and calculations shall be finalized with submittal drawings for the membrane system.

b) Pumps shall be sized using the Seller design criteria and will accommodate the maximum number of membrane modules per membrane unit assembly as indicated in the Proposal Pricing Form.

d. PUMP REQUIREMENTS

1) Construction: Construction of centrifugal pumps shall conform to the following requirements:

2) All elastomeric materials such as O-rings and gaskets shall be compatible with the fluid.

3) Coating: Interior water passages of cast iron and ductile iron casing shall be coated with 10- to 12-mils DFT vitreous enamel or 10- to 12-mils DFT fusion bonded epoxy ~~per Section 09 96 00, Painting~~ [Addendum #5]. All external surfaces of cast iron and carbon steel materials shall be coated in accordance with ~~Section 09 90 00, Painting~~ manufacturers recommendations [Addendum #5]. Stainless steels shall not be coated.

e. MOTOR

1) Motor shall operate on 460 VAC, 3 PH, 60 Hz power supply.

2) Motor shall be TEFC-type with worm gear reducer.

3) Motors shall have a 1.15 service factor and shall be NEMA Design B, with Class F insulation. ~~Motors shall have space heaters to prevent condensation in the motor~~ [Addendum #5]. Conduit boxes to be two times NEMA standard. Provide separate boxes for motor leads and for space heater and temperature switch wiring.

4) Each pump and motor shall be furnished with a stainless steel nameplate securely mounted to the body of the equipment which will list manufacturer and model details, and relevant design criteria.

5) VARIABLE FREQUENCY DRIVE

a) Requirements:

(a) The power and control electronics shall be housed in a UL Type 3 enclosure and the combined motor/VFD rating shall be IP55 (protection against dust and nozzle directed water from any direction) or be NEMA 4 rated.

(b) The VFD shall be of the PWM (Pulse Width Modulation) design using IGBT (Insulated Gate Bipolar Transistor) technology.

(c) The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of motor. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor current suitable for centrifugal pump control and to eliminate the need for motor de-rating.

(d) The VFD shall automatically reduce the switching frequency and/or the output voltage and frequency to the motor during periods of sustained ambient temperatures that are higher than the normal operating range. The switching frequency shall be reduced before motor speed is reduced.

(e) An integral RFI filter shall be standard in the VFD.

(f) The VFD shall have a minimum of two skip frequency bands which can be field adjustable.

(g) The VFD shall have internal solid-state overload protection designed to trip within the range of 105-110% of rated current.

(h) The integrated VFD motor shall include protection against input transients, phase imbalance, loss of AC line phase, over-voltage, under-voltage, VFD over-temperature, and motor over-temperature. Three-phase integrated VFD motors shall be capable of providing full output voltage and frequency with a voltage imbalance of up to 10%.

(i) The VFD motor shall have, as a minimum, the following input/output capabilities:

(j) Speed Reference Signal: 0-10 VDC, 4-20mA or Ethernet

(k) Digital remote on/off, or Ethernet

(l) Fault Signal Relay (NC or NO), or Ethernet

(m) Fieldbus communication port (Ethernet IP)

f. APPROVED MANUFACTURER

1) Grundfos

2) Goulds ESH

3) or approved equal

4. Air diaphragm pumps

a. Air diaphragm pumps will be designed for the following services:

1) 12.5% Sodium Hypochlorite

2) 25 or 50~~1%~~ [Addendum #5] Caustic Soda

3) 2% Citric Acid

4) Calcium Thiosulfate or sodium bisulfite [Addendum #5]

b. Pump Construction:

1) General: The pump shall be of the air-operated double diaphragm type and conform to the following requirements:

| | |
|---|---|
| Pump base | cast iron / steel / aluminum |
| Pump casing (wetted) | PVDF |
| Pump casing (dry) | Polypropylene |
| Pump construction | clamped |
| Diaphragms | Santoprene / PTFE / Buna-N |
| Check valves | ball checks |
| Check valve material | PTFE |
| Valve seats | PVDF / Polypropylene |
| Valve seat O-rings | Santoprene / PTFE / Buna-N |
| Pump shaft | 316 stainless steel / nitrided carbon steel |
| Air control valve | self-lubricated or oil-lubricated |

c. MANUFACTURERS OR EQUAL

1) Wilden / PSG, or approved equal

5. Compressed Air System

Clarification: due to space constraints, oil-free scroll type compressor will be used

a. Air Compressors:

1) Compressors shall be Oil Lubricated Rotary Screw type, direct driven complete with inlet filter / silencer, discharge check valve, motor, and automatic pressure unloader, providing no load starting.

2) Each compressed air module shall consist of, but not necessarily be limited to, the following: compressor, drive motor, oil system, air system; electronic regulating controls, sound attenuating enclosure, starter cubicle and integrated refrigerant air dryer (dryer not required if a blower is used for backwash air supply) [Addendum #5].

3) Compressors of oil type shall use food grade lubricants if used in direct contact with potable water, such as air scour or integrity testing. The oil lubrication system installed with each module shall be of the differential pressure type consisting of an ASME approved air/oil separator unit including, but not limited to, the following: separator element; oil fill tube; oil level indicator; oil filter of the spin-on type rated at 10 microns; oil cooler; and thermostatic oil cooler bypass valve.

4) Air handling systems installed with each module shall consist of the following: dry type air intake filter rated at 3 microns; pneumatically operated air intake valve/unloader assembly; minimum pressure/check valve; air/oil separation system; discharge air shutoff valve; and motor driven compressor cooling fan.

5) Each air compressor module shall have a compact welded aluminum combination cooler, and a moisture separator/trap including both automatic and manual drain lines.

6) The compressor shall be enclosed by sound attenuated panels designed to limit noise to a maximum of 76 dB(A).

7) Compressors shall use an air-cooled heat exchanger.

8) Provide compressed air equipment from one of the following manufacturers:

   (a) Atlas Copco Series GA

   (b) Atlas Copco Series ZT

   (c) Ingersoll Rand SSR

   (d) Ingersoll Rand 2340L5

   (e) Kaeser

b. Refrigerated Air Dryers:

1) An integral refrigerated dryer shall be furnished with each compressor module if compressed air is used for backwash air supply [Addendum #5]. Each dryer shall Include the following pre-cooler/reheater, refrigerant compressor; liquid separator; press-o-stat regulator of condenser fan operation; expansion valve; R22 refrigerant; and pressure dew-point indicator monitored through the control module.

2) Rate air dryers in accordance with the standard rating conditions of the National Fluid Power Association for class H dryers, i.e., 33 to 39 degrees F pressure dewpoint range at the specified minimum discharge pressure and 100 degrees F inlet air with a maximum pressure drop of 5 psi.

3) Under this rating, provide the dryers with a capacity not less than 20 percent above the maximum total free air delivery of each dedicated air compressor,

4) Equip each refrigerated air dryer with a condensing unit, refrigerant evaporator, mechanical separator automatic condensate discharge valve, high discharge air temperature alarm light, and switch for actuating a remote alarm, prefilter, and afterfilter. The air dryer shall be integrated into the compressor design and part of the compressor enclosure.

5) After-filter: Equip dryers with filters to remove oil, carryover, oil aerosols and other foreign matter. Install a prefilter near the dryer inlet and install an afterfilter near the dryer discharge. Design the prefilter for mechanical removal of solid and liquid particles, equipped with a porous bronze filter element with a 5 micron rating. Provide an afterfilter of the coalescing type with a 0.5 micron rating.

6) Acceptable Manufactures: Provide refrigerated air dryers from one of the following manufactures:

   a) Atlas Copco

   b) Ingersoll Rand

   c) Kaeser

c. Air Receivers and Air Surge Tank:

1) The air receiver shall be a vertical tank of all welded, carbon steel construction with semi-ellipsoidal heads and leg supports for mounting on a concrete base. The receiver shall be designed and constructed in accordance with the ASME Code for Unfired Pressure Vessels and shall bear a code stamp. Receivers integral to the compressor will also be allowed [Addendum #5].

2) Receivers shall be complete with a pressure transmitter, pressure, gage, pressure relief valve, automatic drain valve, and appurtenances. Receivers and surge tank shall be provided with an internal factory applied epoxy lining.

3) The minimum receiver size is 60 gallons. The minimum pressure rating is 200 psig.

4) The receiver shall be provided with piping connections for an inlet, outlet, drain, pressure relief valve, and cleanout opening.

5) The receiver shall be suitable for installation outdoors on a concrete pad. The manufacturer shall submit calculations documenting compliance of vessel support and recommended anchorage according to Section 01 33 17, Structural Design, Support, and Attachment.

6) Manufacturer

a) Hanson

b) Manchester

c) Brunner

d) Ingersol Rand [Addendum #5]

d. Coalescing Filters:

1) Coalescing type oil removal filters shall be provided. The filters shall remove 99.995% of the solids and liquids 0.3 micron or larger in size with replaceable filter elements. Filters and housings shall be sized and selected by the Seller to meet requirements of the system.

2) Supply air filter assemblies shall be provided by the Seller for each compressor. Each assembly shall include the following: filters (3); filter support bracket; outlet ball valve; auto drain valve assemblies (3).

3) The Seller shall provide support brackets with cutouts to the filter housings. The support brackets shall be constructed of Type 304 stainless steel and shall contain labels for the filter housings as well as inlet and outlet sides of the assemblies.

4) Differential pressure indicators shall be provided for the filter assembly.

5) Manufacturer

a) Pall - Filterite

b) Ingersoll Rand

c) Zeks

d) Atlas Copco

e. Particulate or Membrane Air Filters:

1) For air that is in intimate contact with filtered water, hydrophobic membrane particulate filters with an absolute range of 0.02-micron removal shall be provided. The filters shall have replaceable cartridges. Filters and housings shall be sized and selected by the Seller to meet requirements of the system.

2) Air filters with a 1-micron removal rating instrument air and valve actuation.

3) Differential pressure indicators shall be provided for the filter assembly.

4) Manufacturer

a) Pall - Filterite

b) Millipore

c) Parker

d) Zeks

e) Atlas Copco

f. Air Regulator Assembly:

1) Provide an air regulator assembly consisting of inlet valves, pressure relief valve, air muffler, pressure indicator, and outlet valve at the receiver outlet. Provide an installed spare air regulator assembly identical to the above.

2) Air regulators at each air source is acceptable in lieu of a regulator assembly.

3) Individual control air regulator assemblies shall be installed as shown on the Drawings.

4) Air filters shall be furnished complete with housing, support bracket, and removable filter cartridge. The support bracket and associated hardware shall be Type 304 stainless steel. Filters and housings shall be sized and selected by the Seller to meet requirements of the system.

5) Manufacturer

a) SMC

b) Norgren

c) Cashco

d) Emerson ASCO [Addendum #5]

g. Fabrication Requirements (Materials of Construction)

1) All mounting hardware shall be Type 304 Stainless Steel.

6. Automatic Self-Cleaning Strainers

a. Strainers shall be of the motorized or pneumatic [Addendum #5] automatic self-cleaning type. The equipment shall be designed to continuously remove suspended particles from the pumped raw water.

b. Construction

1) Strainer shall be of the self-cleaning type, on-line style. It shall consist of an outer carbon or stainless [Addendum #5] steel with potable grade interior epoxy coating, cast-iron, ductile iron or stainless steel [Addendum #5] body, an internal 316 stainless steel screen element sealed with an upper and lower seal ring, and a rotating, backwash arm that discharges the backwash water through an outlet nozzle.

2) The use of carbon steel for any wetted strainer surfaces is not acceptable under any circumstance.

3) Backwash cleaning of the screen is accomplished by utilizing the pressure differential between strained water discharge pipe and atmospheric pressure. Backwash cycles can be initiated on an operator adjustable differential pressure set point or on a time cycle. Process flow shall remain completely uninterrupted during the backwash cycle.

4) The Seller is responsible for verifying the membrane system design will have adequate backpressure to achieve the minimum backwash supply pressure as required by the selected strainer manufacturer.

5) The unit shall be designed so that the entire operating assembly, motor, gear reducer, cover, backwash and assembly, screen element, and bearing housing, lift from the filter body as a complete unit.

6) The strainer shall be rated for service at 150 psi @ 100°F and ASME code stamped. Inlet and outlet connection shall be flanged and designed and constructed in accordance with both ANSI and ASME Section VIII, Division 1.

~~7) An inspection port shall be provided to permit visual inspection of filter element without removing drum.~~ [Addendum #5]

8) A drain opening shall be provided in the lower part of the strainer body to permit drainage without removing drum.

9) The straining element shall be 316 stainless steel with 300 micron screen size. The Seller may require a smaller retention efficiency of the strainer for protection of downstream equipment. Wedge wire or slotted screens are not acceptable.

10) If the raw water pressure is not sufficient to backwash the strainer, the strainer shall be modified to use filtered water for backwashing of the strainer. The design and operating capacity of the membrane system shall be increased by 1 percent to account for strainer backwash water losses.

11) The motor shaft shall be sealed by a drip-proof mechanical seal. The use of packing or any other sealing arrangement is not acceptable under any circumstance.

c. Motor:

1) Motor shall operate on 460 VAC, 3 PH, 60 Hz power supply.

2) Motor shall be TEFC-type with worm gear reducer.

d. Spare Parts:

1) The following spare parts shall be furnished:

2) One set of replacement filter media for strainer.

e. Manufacturers:

1) Amiad

2) Fluid Engineering.

3) Kinney.

4) Forsta

7. Containerized membrane system control system

a. A master control panel in a NEMA 4 painted mild steel wall mounted enclosure shall be furnished by the manufacturer of the ultrafilter system for each containerized unit provided. The control panel shall be wired to accept a 120 volt power feed. The filter control system shall be manufactured in a UL508A/ 698 certified panel shop.

b. The control panel shall be capable of communicating with the main Water Treatment Plant's GE/Emerson PLC system through a suitable protocol converter. All process data, alarms, operator controls, and process setpoints shall be made available to be read and written by either the Alder Creek Main PLC or the Alder Creek SCADA system.

c. A master control panel in a NEMA 4 painted mild steel enclosure shall be furnished to provide communication between each supplied containerized unit and the neutralization system.

d. The control panel shall incorporate an Allen Bradley CompactLogix Programmable Logic Controller (PLC) for accomplishing the control logic. The PLC shall be connected to the plant network via an Ethernet communication link. Communication protocol shall be Ethernet I/P. The panel shall have the capability to be accessed remotely via the plant Ethernet network through an integrated VPN connection.

e. A 19" Allen Bradley AdvanTech Panel PC or with Factory Talk View ME color touchscreen graphical operator interface shall be provided in the PLC panel for viewing system status and entering operator selected functions and operating variables. PC may also be supplied by B&R Automation with 19" color touchscreen graphical operator interface. [Addendum #5].

f. The PLC shall be supplied with a minimum of 20% spare I/O that is to be prewired out to the terminal strip for future for plant integration. The PLC shall incorporate the proper quantities of the following components to make a complete operational system.

g. I/O can be from Allen Bradley, Numatics or Wago as per the vendor's preference.

h. The control panel shall be provided with all necessary fuses, relays, circuit breakers, power distribution blocks, 24 vdc power supplies, and Ethernet VPN router to make a complete and operational system.

i. All wiring shall be brought to a terminal strip for interface with external devices. Terminals shall be cage type with screw terminal connection. No more than two wires shall be connected to one terminal. Multi-level terminals are acceptable. Terminals shall be manufactured by Phoenix Contact or equivalent.

j. The control system shall allow for automatic control of all functions of the ultrafilter process. There shall also be manual control of all equipment via the operator interface.

k. The control system shall be designed to allow for integration with the existing equipment onsite and shall have the ability to interface with the existing level instrumentation and feed water supply pumps.

l. The control panel shall be provided with a properly sized control power transformer. This transformer is to have both primary legs and one secondary leg fused.

m. Local distributed I/O panels or NEMA 4 integrated blocks (without panel) shall be provided for the ultrafiltration trains and CIP skid. The panels/blocks shall be NEMA 4 painted mild steel and will be skid mounted. The control panels will house Allen Bradley Flex I/O or Emerson Numatics integrated racks to interface back to the master control panel. The panels will be supplied with a manifold system to distribute the required service air to the appropriate skid mounted automated valves. This manifold shall be provided with the proper quantities of solenoid valves rated for control of the skid mounted control valves. A combination regulator / filter shall be provided within the control panel to ensure that clean air is supplied to the manifold at the proper pressure.

8. Valves

Clarification: all valves and actuators will be supplied as follows: Bray Series 3L lug style butterfly valves (trim as follows: ductile iron body, nylon coated ductile iron disc, 416 SS shaft and EPDM seats), and Bray Series 92 double-acting pneumatic actuators with no limit switches

a. Automated Butterfly Valves

1) For valves that are in locations where reliability is a consideration, or for automated valves that automatically modulate for flow control or actuate with periodic backwashing or other Seller- designated terminology describing the reversal of periodic flow through the membrane system that occur at design intervals of less than 2 hours, the Seller will provide resilient seated valves.

2) Valves shall provide ANSI Class VI shutoff

3) Materials of Construction

a) Body: 316 Stainless Steel or Cast Iron [Addendum #5]

b) Disc: 316 Stainless Steel

c) Shaft: 17-4PH SS or 316 Stainless Steel

d) Pins: 316 Stainless Steel

e) Seats and Seals:

(a) Water Service-EPDM

f) Compressed Air - Teflon – PTFE – EPDM [Addendum #5]

g) Process Air - Fluorocarbon (Viton, RTFE, or Fluorinated Hydrocarbon Elastomer - ASTM D1418) rated for 300 degrees minimum or higher if required by process.

h) Backing Ring: Stainless Steel

i) Bushing / Bearings: EPDM or RTFE

j) Packing: PTFE

4) Throttling or rate of flow control valves may be of the butterfly type. The Seller shall submit calculations to verify that valve cavitation does not occur over the operating range of the valve. Full wet FAT testing is acceptable in lieu of calculations [Addendum #5].

5) Bolting Pattern - Lugged valves shall be used.

6) Acceptable manufacturers:

a) Keystone - K-Loc High Performance Butterfly Valve - F362

b) DeZurik- High Performance Butterfly Valve

c) Flowseal (John Crane) - Soft Seat High Performance Butterfly Valve

d) Jamesbury - Wafersphere - High Performance Butterfly Valve

e) Fisher - PosiSeal

f) Masoneilon Dresser - High Performance Butterfly Val

g) Bray, 31 Series

b. General Service

1) Service Conditions - General Service – less than 30 inches in diameter:

a) One Piece Body

(a) Unless otherwise specified or approved by the Engineer, all valves shall be lugged style.

(b) Body: 1 piece cast iron or ductile iron body

(c) Disc: 316 Stainless Steel

(d) Stem: 316 or 416 Stainless Steel

(e) Bushings: PTFE

(f) Pins: Stainless Steel

(g) Seats and Seals:

(i) Water Service – EPDM, Viton

(ii) Compressed Air - Teflon – PTFE, Viton

(iii) Process Air - Fluorocarbon (Viton, RTFE, or Fluorinated Hydrocarbon Elastomer - ASTM D1418) rated for 350 degrees minimum or higher if required by process.

(h) All valves shall be furnished with two upper and one lower bearings/bushings of PTFE material. Shaft seals shall be provided to prevent leakage and to protect bearings from internal or external corrosion.

(i) Valve seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall also act as a body liner to prevent flow from contacting the body casting. Seats shall have flange sealing to provide a positive seal without use of flange gaskets.

(j) Valves shall have a dead-end shutoff differential pressure rating equal to or greater than 50 psig (with flanges installed on each valve face). Valves to be suitable for and rated for full vacuum service.

(k) Body wall shall exceed requirement for AWWA C504 Class 150 standard.

(l) The disc shall be secured to the shaft using at least two Type 316 stainless steel pins or self- locking setscrews.

(m) Valves shall have the ability to be installed with the disc in the closed position.

(n) Valves shall be suitable for process air or vacuum service.

(o) Factory Testing: Test shall be conducted on each valve in accordance with manufacturer’s Quality Control procedures.

(p) Acceptable Manufacturer

(i) DeZurik –Type BRS.

(ii) Centerline Model 200/225

(iii) Keystone 602.

(iv) Bray Series 70

(v) Bray Sries 92

b) Two Piece Body

(a) Butterfly valves 2-inch to 12-inch shall be flange, lugged style, 150 psi class butterfly valves using a 2-piece cast iron body and 316 stainless steel paddle.

(b) Valve seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall have flange sealing to provide a positive seal without use of flange gaskets.

(c) Valves shall be 316 stainless steel. Shaft diameter shall be suitable for 150 psi service (2 to 12 inch valves).

(d) Discs shall be 316 stainless steel and use a thin profile disk. The disc-to-shaft connections shall be Type 316 stainless steel.

(e) Pins, shaft, and disc of all valves shall be individually machined and completely interchangeable.

(f) Valves shall be compatible with the fluids in contact with the valve at a maximum temperature of 110°F.

(g) Factory Testing: Test shall be conducted on each valve in accordance with manufacturer's Quality Control procedures.

(h) Acceptable Manufacturer

(i) Keystone – Resilient Seated Valve Type 920

(ii) Or-Equal will not be accepted (use 1 piece body valve).

c. Type 3 Butterfly Valve

1) Service Conditions - Backwash chlorine solution and other concentrated chemical or cleaning solution in contact with the valve.

2) Valves 1" and above in contact with chlorine solution above 50 ppm or other cleaning solution where stainless steel is not appropriate for contact shall use a flanged, lugged style, 150 psi butterfly valves using cast iron body and Teflon coated disc with a replaceable valve seat.

3) Acceptable manufacturers and models.

a) Keystone - Resilient Seated Valve Types 920

b) DeZurik - Resilient Seated Valve Type BGS

c) Bray Series 22/23 or Series 31 [Addendum #5]

d. Stainless Steel Isolation Ball Valves

1) Stainless steel isolation ball valves are required for pressure gauges, pump casing drains and other locations as shown on the Drawings.

2) The Ball Valve shall consist of a type 316 stainless steel body, a polished stainless steel ball and a Teflon seat. The valve shall be equipped with a lever type handle. The valve shall have a minimum working pressure of 800 psi WOG (Water-Oil-Gas)

3) Ball valve of 2 inches or less shall have NPT threads, Ball valves used in caustic service or in applications larger than 2-inches shall have flanged end connections.

4) Provide double acting pneumatic actuators using the same manufacturer of the valve, if required for valves less than 1-inch in size.

5) Acceptable Manufacturers

a) Apollo Type 76

b) Watts Type S-8100 and S-8000

c) Whitey (Swagelok) Series 40

d) Parker H-series

e) Flow-Tek

f) John Guest

e. PVC Plastic Ball Valves

1) PVC or CPVC Plastic Ball valves shall use a True Union Design.

2) The elastomer shall be compatible with the chemical service.

3) Acceptable Manufacturers·

a) Spears

b) Nibco - Chemtrol

c) Asahi -Duo Block

f. Brass Ball Valves

1) Description: Three-piece brass ball valve, in sizes up to 2-inches

2) Operating Conditions: Install where noted or shown

3) Design Requirements:

4) Maximum Operating Pressure: 600 psig

5) Rated Operating Temperature: 200°F

6) End Connections: 600 WOG, conforming to MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

7) Actuator: Manual, lever type

8) Materials:

a) Body: Brass, ASTM B30 - Standard Specification for Copper Alloys in Ingot Form

b) Ball: Hard Chrome plated brass ball

c) Stem: Brass, ASTM B30 - Standard Specification for Copper Alloys in Ingot Form

d) Seats: Glass reinforced Durafil

e) Seals: PTFE

f) Bolting: Type 316 stainless steel

9) Manufacturers:

a) Watts Series B-6000

b) Apollo

g. V-Notch Ball Valves

1) Ball valves suitable for throttling are required for general water service as shown on the Drawings,

2) Materials:

a) Body: 316 Stainless Steel

b) Ball: 316 Stainless Steel

c) Shaft (Stem): 17-4 PH or 316 stainless steel.

d) Actuator: The ball valves shall have provisions for mounting an actuator, positioner, and valve position feedback module.

3) Acceptable Manufacturers

a) Worcester Controls V-Seat

b) DeZurik VPB

c) Fisher Vee-Ball

h. Type 1 Check Valve – Globe Style

1) Size and Extent: Membrane Raw Water Pump Discharge, as shown on Drawings.

2) Working Pressure: 150 psi

3) Silent operation check valves. The operation of the valve shall not be affected by the position in the pipeline. The valve disk shall be concave to the flow in the pipeline and guided by center shaft. The globe style check valve shall have an open area equal to or greater than the pipe diameter. Valves 10- inch and smaller shall be capable of mounting directly to a butterfly valve.

4) Check valve shall be spring loaded, normally closed by means of a heavy-duty center guided, stainless steel springs. Flow from the pumps shall cause the valve to open and upon pump shut down, the spring will shut the valve before reverse flow starts and at a point of zero velocity of non-slam closure.

5) Valve body shall be cast or ductile iron. Valve seat and disk will be Bronze. Seating shall be resilient and watertight. The sealing element shall be EPDM or Viton (Buna-N is not acceptable) and provide zero leakage. The torsion spring shall be stainless steel. All component parts shall be field-replaceable.

6) Manufacturers:

a) Valmatic, Type 1800

b) Apco, Model 600

c) Golden Anderson, Model 280 or 288

i. Double Disc or Double Door Style Check Valves

1) Service Conditions: Pump Discharges

2) Body: 316 Stainless Steel if in contact with crp

3) Body: Ductile iron if not in contact with crp

4) Seat and Bushings: 316 Stainless Steel

5) Spring and Screws: 316 Stainless Steel

6) Seals:

a) Water: Viton, EPDM (Buna-N is not acceptable)

b) Process Air: Fluorocarbon (Viton, RTFE, or Fluorinated Hydrocarbon Elastomer ASTM D1418) rated for 350 degrees minimum or higher if required by process.

7) Manufacturers:

a) Valmatic, Model Dual Disc

b) Centerline, Model 800

c) APCO, Model 900

j. Check Valve

1) Service: as indicated on Drawings

2) Style: Plastic Ball Check Valve

3) Manufacturers

a) Nibco - Chemtrol

b) Asahi

c) Spears

k. Check Valve

1) Service: Instrumentation and Sample Lines

2) Style: Diaphragm Check Viton Elastomer

3) Material: PVC

4) Manufacturer

a) Plastomatic

l. Check Valve

1) Service: Vacuum Line

2) Style: Swing Check, Threaded End Connections

3) Material: Stainless Steel Type 316

4) Manufacturer

a) Truline

b) Sure-Flow

m. Check Valve

1) Service: Water/Air, I-inch

2) Style: Poppet Check, Tube or NPT fittings

3) Material: Stainless Steel Type 316

4) Manufacturer

5) Swagelok C Series

6) Check Valve

7) Service: Water/Air, I-inch

8) Style: Poppet Check, Tube or NPT fitting

9) Material: Brass Type 360/316

10) Manufacturer

a) Swagelok C Series

9. Valve Actuators

a. Pneumatic Valve Actuator Operators

1) Service Conditions: General Service Quarter Turn Butterfly and Ball Valves

2) Cylinder actuators shall have working mechanism fully enclosed, and shall be sized for operation using 80 psig pneumatic supply. Cylinder actuators shall have pilot valves where indicated on the drawings. Units shall have adjustable end position stops. All valve actuators shall include proximity type limit switches. Limit switches shall be programmed to register the open and closed positions. Tubing connecting valve mounted solenoids to the actuator shall be type 316 stainless steel.

3) Pneumatic actuators shall be capable of producing a minimum of 1.5 times the required operating torque.

4) Materials of Construction:

a) Actuator Body and End Caps: Aluminum

b) Piston: Aluminum

c) Seals: Nitrile or EPDM

d) Pinion Shaft: Stainless Steel

5) Special Valve Actuator Finish: The exterior finish of the valve actuation shall be provided with a special corrosion resistant finish to resist unanticipated or accidental spray of acid, base or oxidants. Acceptable finishes include:

a) epoxy coating

b) electro-less nickel. Anodized aluminum shall not be used for the exterior finish of the valve actuator.

6) Provide valve disc position indicator on operator.

7) Acceptable Manufacturers

a) Keystone 1Morin Type MRP

b) DeZurik - Compak II

c) John Crane - Centerline Series 33000/38000

d) Jamesbury - Type ST or SP

e) EL-O-Matic

f) Bray Series 70 or 92/93 [Addendum #5]

b. Electric Valve Actuator:

1) General: Electric motor operators shall be furnished complete with motor, extension bonnet, torque tube, position indicator, integral reversing starter, and controls specified herein. All components shall be entirely suitable for outdoor service.

2) Electric motor operators shall conform to AWWA C504, except as specified herein.

3) Electric motor operators shall be capable of producing a minimum of 1.5 times the required operating torque.

4) Voltage: 110 VAC, 60 Hz, 1 phase. Provide for 110 volt control power or 24VDC, 4-20 mA control signal as required and as shown on drawings.

5) Enclosure: NEMA 6 (IP 68)

a) Non-intrusive entry with no mechanical parts penetrating the control enclosure of the actuator.

b) Double O-ring seals

c) Separately sealed terminal compartment.

6) Mounting Hardware: Provide extension bonnet, torque tube and bonnet supported floor stand for mounting each electric operator on valve with shaft vertical in horizontal pipeline.

7) Controls:

a) Provide dry contacts for remote indication of:

b) Ready to operate-control voltage available, fuses and overloads intact

c) Valve full open

d) Valve full closed

8) Display: Provide LCD Display of valve position, calibration and diagnostics.

9) Starter: Provide reversing contactor III NEMA 4 enclosure integrally mounted on operator.

10) Thermal Protection: Provide winding thermal protection.

11) A feedback position transmitter shall be supplied with each modulating service valve.

12) Provide valve disc position indicator on operator

13) Manufacturer:

a) Rotork IQ

b) Limitorque MX

10. Flexible connections shall be provided at piping terminations as shown on the Drawings. Use materials approved for potable water. Buna-N elastomers are not acceptable. The stainless steel expansion retaining rings shall be supplied with stainless steel control rod assemblies.

a. Manufacturers

1) Red Valve Type J-1

2) Proco

3) Mercer Rubber

4) Uniroyal

11. NEUTRALIZATION SYSTEM

Clarification: CIP neutralization system is supplied within UF containers, so no separate neutralization system

a. Neutralization Container: One neutralization system shall be provided that is sufficiently sized for neutralization of chemicals used in the maintenance clean and clean-in-place processes. The container shall include a neutralization pump, tank, chemical metering pumps, pH transmitter, electrical junction box, and all valves and piping necessary for operation. The system components shall be mounted in either a shipping container or skid mounted.

1) Neutralization Recirculation Pump: The neutralization recirculation pump shall be a vertical multi-stage centrifugal pump with a stainless steel housing impeller and shaft as manufactured by Goulds, Grundfos, or equal. The pump shall be supplied with pressure gauges and valves as required.

2) Neutralization Chemical Metering Pumps: All necessary metering pumps shall be supplied for feeding liquid sodium bisulfite and sodium hydroxide from chemical totes into the neutralization skid recirculation piping. The pumps shall be solenoid or motor driven, positive displacement pumps as manufactured by Prominent. Pumps shall be supplied with heads, diaphragms, check valves, foot-valves and isolation valves all compatible with the solution being pumped. The pumps shall be controlled by the UF electrical panel. A shelf shall be supplied on this skid to support the metering pumps above the chemical storage totes (by others).

3) Neutralization Tank: The neutralization tank shall be a closed top, white translucent HDPE tank of sufficient size to contain the chemical waste from any chemically enhanced backwashes, maintenance cleans, or clean-in-place cycles, with sufficient volume to capture and neutralize all chemical waste. The tank shall be supplied with inlet, outlet, and overflow connections. Tank shall have level transmitter and drain connections.

b. In lieu of a containerized or skid mounted neutralization system, a neutralization system located inside the containerized unit will be also be sufficient with all components listed in 11.1.a. Those system components can also be used for other system uses when not performing neutralization of CIP and other waste streams.

2.04 SPARE PARTS

A. Spare Parts for Membrane Filtration Equipment shall be in accordance with Section 01 75 00, Spare Parts.

2.05 SPECIAL TOOLS

A. The Seller shall provide special tools required for disassembly and reassembly or analysis of membrane modules.

B. The Seller shall provide all lifting assemblies, hooks, straps, cables and accessories for removing the membrane modules from the rack assemblies.

2.06 LUBRICANTS

A. Refer to Section 01 73 00, Installation, Operation and Maintenance Manuals for Safety Data Sheet submittal requirements.

**PART 3 -- EXECUTION**

3.01 INSTALLATION

A. Refer to Section 01 62 00, Installation of Membrane Equipment.

3.02 COMMISSIONING

A. The Seller is responsible for the complete commissioning of the MF system after the Notice of Completed Installation.

B. Refer to Section 01 66 00, Commissioning of Membrane Equipment.

3.03 TRAINING

A. Refer to Section 01 73 10, Training of Operations and Maintenance Personnel.

3.04 ACCEPTANCE TESTING

A. Refer to Section 01 67 00, Acceptance Testing of Membrane Equipment.

3.05 OPERATIONAL ASSISTANCE

A. Refer to Section 01 68 00, Operational Assistance.

END OF SECTION

# SECTION 11 30 20 PERFORMANCE PILOT TESTING OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 SUMMARY

A. General:

1. The Seller shall provide a fully integrated and containerized water treatment pilot system that includes feed tank, feed pumps, autostrainers, a MF/UF system with cleaning systems, filtrate pumping, microprocessor controls with panelview HMI, and cellular communications for utilization during the Buyer's 90-Day Pilot Study.

2. The Seller shall provide dispersed equipment including a submersible pump for raw water pumping, a flow paced coagulant feed system, a neutralization / dechlorination system for all waste cleaning solutions.

3. Power shall be 480 volt, 3 phase.

4. Performance Testing shall be conducted per the Pilot Performance Testing Protocol by the Seller (see Exhibit A) as-approved by the Buyer.

5. Pilot results will be used to confirm the basis of design and operating guarantees submitted by the Seller in its Procurement Proposal Evaluation and to obtain OHA approval of the Membrane System.

6. Performance Testing will occur at the City of Sandy's Alder Creek Water Treatment Plant Site which does not have a formal address. The Water Treatment Plant is located 7 miles east of Sandy near Terra Fern Drive.

B. Related Sections:

1. Division 00, Bidding Requirements, Contract Forms, and conditions of the Contract.

2. Division 01, General Requirements.

3. Section 11 30 00, Hollow Fiber Membrane Equipment.

4. Section 11 30 20, Exhibit A Pilot Performance Testing Protocol - 90-Day Pilot Study.

1.02 SUBMITTALS

A. See Specification 01 34 00 for requirements for the mechanics and administration of the submittal process.

B. Operations and Maintenance Manuals:

1. Provide all pertinent operations and maintenance (O&M) manuals for the pilot test unit with the Technical Information submitted with the Proposal.

C. Miscellaneous Submittals:

1. Drawing and Schematic:

   a. Provide an arrangement drawing and a process schematic diagram of the pilot test unit with the Technical Information submitted with the Proposal.

2. Pilot Work Plan:

   a. Submit a Draft Pilot Work Plan that addresses all of the objectives stated in the Pilot Performance Testing Protocol to the Engineer and Buyer per the schedule listed in the Agreement.

      1) Engineer and Buyer will review Draft Pilot Work Plan and provide Seller with comments and revisions.

      2) Incorporate comments and revisions into Final Pilot Work Plan

3. Example report:

   a. Submit for approval an example pilot test report indicating the data collection and reporting that will be performed.

4. Weekly meetings:

   b. Conduct weekly virtual meetings including Seller project manager and Pilot leader with Buyer's team.

   c. Provide graphical and narrative results of the pilot test with more than 24 hour lead time before the meeting to allow Buyer and Engineer review.

5. Pilot Report:

   d. Provide draft pilot report including a description of all pilot activities and data collected for Engineer and Buyer review.

      1) Incorporate Buyer and Engineer comments on the report.

   e. Produce a draft pilot report for OHA review and comment.

      2) Incorporate any OHA review comments on the report.

   f. Produce a final pilot report addressing all comments received.

**PART 2 -- PRODUCTS**

2.01 GENERAL

A. See Exhibit A for product information.

**PART 3 -- EXECUTION**

3.01 SEE EXHIBIT A

**11 30 20 EXHIBIT A**

**Pilot Performance Testing Protocol - 90-Day Pilot Study**

November 2023

Prepared for City of Sandy

by
Stantec Consulting Services, Inc.

## Table of Contents



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## PART 1 -- GENERAL

1.01 INTRODUCTION

A. The Seller will provide all labor and materials for execution of the pilot study except as noted.

B. The Buyer will install interconnecting piping, prepare level and gravel pads for equipment, arrange and pay for off-loading of equipment, provide all chemicals, pay for all power, provide labor for daily one-half hour checks of equipment.

C. The pilot study shall include:

1. Containerized pilot equipment including:

a. Feed tank / pumping

b. Autostrainers

c. Membrane Filtration

d. Cleaning systems

e. Filtrate tank / pumping

f. Microprocessor controls with panelview HMI

g. Cellular communications with remote access

2. Dispersed pilot equipment:

a. Raw water coagulant addition (flow paced)

b. Cleaning solution waste pH-neutralization and dechlorination system

## PART 2 -- PILOT PERFORMANCE TESTING PROGRAM

2.01 PILOT PERFORMANCE TESTING PROGRAM OBJECTIVES

The primary objectives of the *Pilot Performance Testing Program* is to confirm Seller's proposal and meet OHA's requirement for pilot testing membrane treatment systems prior to granting a construction permit.

2.02 PERFORMANCE CRITERIA

A. At minimum, the MF/UF System shall demonstrate the following during the pilot study:

1. Seller's proposal.

2. Meet finished water quality requirements listed in Table 1.

3. Operate at a recovery of at least 95 percent.

4. Meet criteria 1, 2, 3, and 4 while requiring clean in place (CIP) no more frequently than once every thirty days.

5. Demonstrate membrane integrity during the pilot test consistent with requirements of the Long Term 2 Enhanced Surface Water Treatment Rule.

6. Note: Feed water quality ranges to be used for MF/UF System design are summarized in Table 2 in Section 11 30 00, Hollow Fiber Membrane Equipment.

**Table 1 – Finished Water Quality Requirements**

| Parameter | Units | Requirement |
|---|---|---|
| MF/UF Water Quality Requirements | | |
| Total Iron | mg/L | ≤ 0.1 |
| Total Manganese | mg/L | ≤ 0.05 |
| Maximum Turbidity | NTU | < 0.1 |
| Color | Pcu | <1 |

2.03 PROCESS DESCRIPTION

A. See Section 11 30 00, Hollow Fiber Membrane Equipment and other Sections.

2.04 PILOT PERFORMANCE TESTING PROGRAM SCHEDULE OVERVIEW

A. The overall pilot evaluation will commence immediately following selection of a Seller. The pilot shall be operated 24 hours per day for a minim run-time period of 90 days excluding installation, startup, maintenance, and decommissioning; but including optimization and at least two 30-day design runs with fixed operating parameters. Liquidated damages and schedule are specified in Section 00 52 00, Procurement Agreement.

B. Pilot Preparation and Coordination

1. During pilot preparation and coordination, pilot shipment and laboratory contract arrangements will be made. A *Pilot Work Plan* (see Part 4) that addresses all of the objectives stated in Article.

2.1 will be created and agreed upon by all involved parties. Specific activities and corresponding responsibilities are listed in Paragraph 3.1.1.

C. Pilot Evaluation Phase I

1. Phase I is for startup and commissioning of the pilot system. This period will provide an opportunity for tuning of control systems, calibration of instrumentation, and implementation of the data collection procedures. Training of Buyer's staff will occur during this time period. The Quality Assurance program shall be initiated, including verification of data collection and reporting systems.

D. Pilot Evaluation Phase II

1. During Phase II, the MF/UF System will be run at the conditions as bid in the Proposal. All MF/UF System Design and Performance Criteria as specified in Article 2.2 in Section 11 30 00, Hollow Fiber Membrane Equipment, all applicable conditions bid by the Seller, and all performance criteria specified herein shall be met greater than or equal to 95 percent of the time throughout the duration of this phase for the phase to be deemed successful. Should the results indicate system performance capabilities that are less than this, see Article 5.05 in Section 00 52 00, Procurement Agreement.

E. Pilot Evaluation Phase III

1. During this phase, the Seller shall repeat Pilot Evaluation Phase II for confirmation.

F. Pilot Summary Report

1. At the conclusion of the pilot, a Final Pilot Summary Report will be generated. This report shall include, but not be limited to, an introduction of the existing treatment and pilot study; description of operation; presentation and discussion of results; conclusions and recommendations drawn from the study; and associated test data, tables, and graphs. The final report shall include information listed in Part 5.

2.05 PILOT UNIT (EQUIPMENT, CHEMICAL, AND ANALYTICAL) SPECIFICATIONS

A. **All equipment used to comprise the water treatment pilot system shall be less than 10-years old and be in good-working condition**. The overall pilot unit will include all pumps, tanks, compressors, chemicals, and other ancillary systems needed for full operation during the pilot testing. The pilot units shall be designed as self-contained systems that have their own raw water boost pump, air supply, and dryer for pneumatic valves, MF/UF chemical maintenance clean systems, control valves for adjusting production rate and recovery, pressure vessel assemblies designed for 95% recovery without backwash water recovery, instrumentation and controls for controlling the system and collecting the data on the process variable that effect performance and sample points for monitoring and collecting different process streams (Raw feed water, MF/UF filtrate, MF/UF backwash waste, final water (blended) for analysis. A PLC for automatic operation and alarm protections shall be provided. The Seller shall operate and maintain the pilot, not the Buyer.

B. The same MF/UF membrane modules and process conditions must be used in the test unit as proposed for the full-scale system, including membrane fiber, material, chemistry, and module construction. A proposed full-scale system, which employs membrane tanks/housings containing multiple modules/elements, may use membrane tanks/housings in the performance testing which contain fewer modules/elements, so long as the configuration accurately represents the hydraulic design of the full-scale configuration.

C. The various membrane filtration products operate in different manners, with different backwash techniques for maintaining performance. A complete description of the operation of each membrane system must be provided by the Seller in the *Pilot Work Plan* (see Part 4). These descriptions will become a part of the test data record.

D. Pilot System Checklist

1. A Pilot System Checklist is summarized in this paragraph. This list describes the membrane equipment and other ancillary systems to be supplied and installed by the Buyer and Seller. In general, the Seller shall be responsible for providing all interfaces needed to support the operation of the pilot unit.

2. Power Supply

    a. Seller shall furnish electrical requirements for pilot plant to Buyer.

    b. Buyer will provide power and connections for operation of pilot system.

    c. Buyer will install the electrical line disconnects from power source to the submersible feed pump and the pilot trailer under the direction of the Seller.

    d. Seller shall provide cellular communications and internet services required for the installation and operation of the pilot unit.

3. Water Supply

    a. Buyer will provide feed water at the pressure require for operation of the pilot.

    b. Seller shall determine feed piping size configuration, pump capacity, and requested discharge pressure needed to supply feed water to pilot system and provide drawings/schematics to Buyer.

    c. Buyer will supply the interconnecting piping for raw water supply to the pilot unit.

4. Waste Disposal

    a. Seller shall segregate backwashing waste from chemical wastes.

    b. Seller shall provide pH-neutralization and dechlorination system for waste cleaning solutions.

    c. Seller shall determine waste piping size and configuration needed to dispose of all pilot system (pretreatment, MF/UF) waste and provide information to Buyer.

    d. Buyer shall construct waste piping system.

    e. Buyer shall purchase chemicals and arrange for disposal of all unused chemicals at the end of the pilot test.

5. MF/UF Membrane System

    a. Seller shall supply and install an MF/UF pilot system. The MF/UF pilot unit shall:

        1) Produce sufficient volume of filtrate to be representative of full-scale unit performance.

        2) Operate at a minimum 95 percent recovery.

    b. Seller shall provide and install a break tank with sufficient volume (if needed to control and/or regulate flow).

c. Seller shall supply remote control and data acquisition system to operate and collect on-line data from the pilot unit using cellular service.

6. Chemicals

a. Buyer shall provide all chemicals needed during the duration of the Pilot Performance Testing Program. Chemicals include: pretreatment chemicals (coagulant), MF/UF system cleaning chemicals, chemicals needed to neutralize waste streams.

b. Buyer shall provide for disposal of any unused chemicals.

7. Analytical Equipment

a. Seller shall provide the following analytical instrumentation and supporting materials:

1) Handheld pH/conductivity meter with automatic temperature correction

2) pH standard buffer solutions (pHs 4, 7, and 10)

3) Conductivity standard solutions

4) Portable spectrophotometer or colorimeter that can measure UV254, Mn, and Fe

5) Reagents required to test for total and dissolved iron and manganese

6) Turbidity determination device

8. Integrity Testing

a. Integrity testing can be performed by either direct or indirect means.

1) Direct integrity testing will be accomplished through a pressure decay test.

2) Indirect integrity testing will be performed by monitoring permeate particle counts.

b. A test will be performed daily and at the completion of each CIP.

c. Damaged fiber shall be identified by the Seller to the Buyer and Engineer. After notification and examination by the Engineer, Seller shall repair damaged fibers.

## PART 3 -- PERFORMANCE TESTING CONDITIONS AND STANDARD PROCEDURES

3.01 RESPONSIBILITIES

A. Pilot Study Preparation and Coordination

1. Seller shall submit *Draft and Final Pilot Work Plans* to the Buyer and Engineer per the schedule listed in the Agreement. See Part 4 for a list of items to be included in the *Pilot Work Plan*.

2. Engineer will review pilot proposals and request additional information as needed.

3. Seller shall provide general liability and equipment insurance for the pilot system for duration of use including shipment of pilot system to and from pilot site. Proof of liability coverage shall be provided by Seller.

4. Seller shall provide a certificate of insurance for auto and workers compensation.

5. Seller shall coordinate shipment of pilot system to site and provide any required documentation for shipment.

6. Seller will contract with laboratory as necessary for sample analyses required per the *Pilot Work Plan*.

7. Seller will pay for all sample analyses.

B. Pilot Arrival

1. Buyer will provide access to pilot site and raw water supply.

2. Buyer shall receive pilot unit, unload it, and place it in the location for study.

C. Pilot Evaluation – Phase I

1. Seller shall install and connect all necessary components at the beginning of pilot study.

2. Seller shall provide an on-site technician for startup, training, and operation of the system for the duration of the pilot study.

D. Pilot Evaluation – Phases II, III, and IV

1. Seller shall follow the *Pilot Work Plan* agreed upon prior to commencement of pilot study.

2. Seller shall collect all samples as indicated in the *Pilot Work Plan*.

3. Seller shall contract with laboratory for outside analytical services and sample containers.

4. Buyer shall collect samples and arrange sample shipment.

5. Buyer shall inspect the pilot unit daily and make up chemical solutions.

6. Seller shall collect and provide all analytical results obtained during the pilot study to the Buyer and Engineer weekly.

E. Pilot Removal

1. Seller shall decommission pilot unit, package equipment, and pay for return shipment.

2. Buyer shall load equipment (all equipment provided by Seller) onto the truck or trailer for return shipment.

3. Seller shall coordinate return shipment of pilot unit and provide any required documentation for shipment.

4. Buyer will disconnect electrical service.

5. Buyer will remove and return interconnecting piping.

F. Pilot Evaluation Reports

1. Seller shall assemble, interpret, and summarize results of all pilot operational and analytical data and provide to Buyer and Engineer on a weekly basis. A brief weekly e-mail and conference call shall be held between Seller, Buyer, and Engineer to discuss summarized results and proposed plan for the following week. See Part 5 for specific requirements.

2. Seller shall prepare a Final Pilot Summary Report at the completion of the *Pilot Performance Testing Program*. The report shall include, but not be limited to, an introduction of the existing treatment and pilot study; description of operation; presentation and discussion of results; conclusions and recommendations drawn from the study; and associated test data, tables, and graphs. Refer to Part 5 for specific information to be included.

G. Pilot Unit Operation and Maintenance

1. Seller shall provide and be responsible for the cost of an operator for daily operation and maintenance of the pilot system.

2. Seller shall set up any workspace or remote communication needed for pilot plant operator.

3. Seller shall be responsible for cost of labor and other expenses associated with purchase and installation of any replacement parts and any other maintenance associated with the pilot system.

4. Seller shall provide spare parts for typical pilot maintenance issues (e.g., flow meter fouling, faulty turbidimeters, etc.). These spare parts shall be shipped with the pilot system and remain on-site during pilot duration.

5. Buyer and/or Engineer will not be held monetarily liable for any circumstances related to pilot maintenance issues that result in the 90-Day Pilot Study time frame being exceeded (see Article 2.4). If necessary, the Buyer can do a visual check daily to look for problems. The Buyer will not operate or maintain the equipment.

H. Safety

1. Seller shall arrange for proper safety equipment to be onsite for duration of pilot study.

**PART 4 -- PILOT WORK PLAN**

The items listed below (at a minimum) need to be included in the *Pilot Work Plan.*

4.01 DESCRIPTION OF PILOT SYSTEM EQUIPMENT

A. The *Pilot Work Plan* shall include a description of all equipment (pretreatment, MF/UF System, and all ancillary equipment including pumps, tanks, neutralization, etc.) to be used during pilot. Description shall include manufacturer names, operating procedures, operating flows and limitations, volumes, etc. A flow schematic description and P&ID of the pilot system shall be included.

4.02 DETAILED SCHEDULE OF ACTIVITIES

A. Schedule shall include operational plans for all pilot Phases. The schedule shall include proposed plan and associated durations for optimization of fluxes and backwash durations for the MF/UF System. It shall also include anticipated cleaning schedules for MF/UF Systems and membrane integrity tests.

4.03 CHEMICAL DOSAGE REQUIREMENTS

A. All chemical concentration and dosage requirements (including coagulant, etc.) shall be included in the *Pilot Work Plan*. Material Safety Data Sheets for all chemicals to be used during the pilot study shall be included as well.

4.04 OPERATING DATA REQUIREMENTS

A. Seller shall include a daily log sheet in the *Pilot Work Plan* that incorporates minimum operating *data* requirements listed in Table 2. This sheet will be used by the pilot operator. Records of these daily log sheets will be used to compare to applicable on-line recorded operational data.

4.05 WATER QUALITY DATA REQUIREMENTS

A. Seller shall provide an analytical sampling schedule in the *Pilot Work Plan*. Water quality *requirements* and test frequency needed to achieve the *Pilot Performance Testing Program* objectives are indicated in Table 3. All official samples to be used for USEPA monitoring and reporting purposes shall be submitted to an outside approved lab for testing. Supplemental spectrophotometer and other testing should be conducted as needed in addition to the samples listed.

**Table 2 – Minimum Operating Data Requirements**

| **Parameter** | **MF/UF System** |
|---|---|
| Feed Flow Rate (gpm) | Continuous |
| Filtrate / Permeate Flow Rate (gpm) | Continuous |
| Waste / Concentrate Flow Rate (gpd) | Continuous |
| Transmembrane Pressure (TMP) (psi) | Continuous |
| Feed Temperature ($^{O}$C) | Continuous |
| Permeability (specific flux) Calculation[2] | Continuous |

| | |
|---|---|
| Overall Flux | Continuous |
| Overall Recovery | 1 Times per Day |
| Backwash Frequency | Each Backwash Occurrence |
| Backwash Flow Rate (gpm), Total Flow (gal), and | Each Backwash Occurrence |
| Backwash Flush Flow (gpm) | Each Backwash Occurrence |
| Backwash Air Flow (gpm) | 1 Time per Day, 5 Days per |
| Backwash Chemical Requirements | Each Backwash Occurrence |
| Process Air Flow[1] (cfm) | 1 Time per Day, 5 Days per |
| Markers for maintenance cleans | Each clean |
| Markers for recovery cleans | Each clean |

[1] Excluding air used for pneumatic valves and integrity tests.

[2] Calculated value

**Table 3 - Water Quality Parameter Monitoring Frequency performed by Buyer**

| Parameter | Raw Feed Water | MF/UF System | |
|---|---|---|---|
| | | Filtrate | Backwash Waste |
| pH | Continuous | Continuous | Every 2 Weeks |
| Turbidity (NTU) | Continuous | Continuous | Every 2 Weeks |
| Color | Weekly | Weekly | NA |
| Temperature (°C) | NA | Continuous | NA |
| TOC (mg/L) | Weekly | Weekly | Every 2 Weeks |
| DOC (mg/L) | Weekly | Weekly | Every 2 Weeks |
| $UV_{254}$ ($cm^{-1}$) | Weekly | Weekly | Every 2 Weeks |
| Manganese (mg/L) | Weekly | Weekly | NA |
| Iron (mg/L) | Weekly | Weekly | NA |
| Ammonia (mg/L) | Weekly | Weekly | NA |
| Total Alkalinity (mg/L as CaCO3) | Weekly | Weekly | NA |
| Total Hardness (mg/L as CaCO3) | Monthly | NA | NA |
| Aluminum (mg/L) | NA | Weekly | NA |
| Silica (mg/L as SiO2) | Weekly | NA | NA |
| SDS[1] | NA | Weekly | NA |

[1] SDS: THM/HAA5 samples - 5-days, 1,0 mg/l residual, pH8.0

4.06 CLEANING PROCESS REQUIREMENTS

A. The following detailed cleaning process requirements shall be included in the *Pilot Work Plan*.

B. Chemical cleaning procedures including frequency, chemical dosing, flows, duration, and soak times.

C. Cleaning trigger criteria including maximum TMP and time.

D. Submit membrane integrity test procedure.

## PART 5 -- PERFORMANCE EVALUATION

5.01 PARAMETERS FOR EVALUATION OF PERFORMANCE

A. To fulfill the objectives of the *Pilot Performance Testing Program* (Article 2.1) the data collected in Phase 3 testing, will be compiled. All items listed in this part shall be determined during the *Pilot Performance Testing Program* and summarized in the final report.

B. Weekly Pilot Evaluation

1. The Seller shall assemble, interpret, and summarize results of all pilot operational and analytical data and provide to Buyer and Engineer on a weekly basis through an email with attachments and a virtual meeting. Data shall be provided in PDF and Microsoft Excel format each week. System process changes (chemical dosage changes, flux or flow changes, etc.) shall be summarized in e-mail or Microsoft Word format. A brief weekly e-mail and/or conference call shall be held between Seller, Buyer, and Engineer to discuss summarized results and proposed plan for the following week.

5.02 WATER QUALITY

A. All analytical data collected during the pilot study (including all samples as indicated in the *Pilot Work Plan* and those required for the temporary discharge authorization permit) shall be compiled and presented in the Final Pilot Summary Report by the Seller. Data shall be assembled in Microsoft Excel format and shall be attached as an Appendix to the report and provided electronically. Graphs for iron, manganese, hardness, and turbidity (at a minimum) shall be included in the report as well. Explanations shall be provided for all data that does not meet applicable water quality requirements presented in Table 1.

5.03 OPERATIONAL DESIGN PARAMETERS

A. All operational data collected during the pilot study shall be compiled and presented in the Final Pilot Summary Report. Data shall be assembled in Microsoft Excel format and shall be attached as an Appendix to the report and provided electronically in PDF format. Optimum design parameters listed below shall also be included in the final report. An explanation as to how the parameters were optimized shall be included in the report.

B. Optimum Chemical Concentrations and Dosages

1. The following optimum chemical concentrations and dosages shall be included in the Final Pilot Summary Report:

2. Coagulant

3. MF/UF System Cleaning Chemicals

4. All Waste Stream Neutralizing Chemicals.

C. Optimum Parameters

1. The following optimum parameters shall be included in the Final Pilot Summary Report:

2. Average and Maximum TMP for MF/UF Systems

3. Optimum and Maximum Recommended Recoveries for MF/UF Systems

4. Optimum and Maximum Recommended Fluxes for MF/UF Systems.

D. Recommended Operating Conditions

1. Based on the results of the pilot test, the Seller shall provide the recommended operating conditions/parameters for the full-scale treatment system in the Final Pilot Summary Report. These parameters shall include, but not limited to:

a. Pretreatment System

b. Coagulant Dosage and reaction time

c. MF/UF Membrane Treatment Unit

d. Flux and recovery

e. Maximum Acceptable TMP

f. Backwash Interval/Duration/Conditions

g. Maintenance Clean Interval/Duration/Conditions

h. Clean in Place Interval/Duration/Conditions.

5.04 REPRESENTATIVE WASTE STREAM COMPOSITIONS

A. Representative compositions for all pilot system waste streams shall be determined and summarized in the Final Pilot Summary Report.

5.05 CLEANING REGIMES

A. MF/UF System backwashing procedures and CIP procedures for the MF/UF System shall be established during Phases II through IV of the *Pilot Performance Testing Program*. These procedures are to be summarized in the Final Pilot Summary Report and shall contain the following specifics at a minimum:

1. Chemical Information (Concentration and Dosage)

2. pH, Temperature, and Flow Requirements

3. Frequency and Duration

4. Initiation Requirements (TMP Limit, Time, Other)

5. Ancillary Equipment Requirements.

5.06 POTENTIAL CAUSES FOR SYSTEM DEVIATION

A. Any potential causes specific to the site that could cause the overall system to deviate from optimum performance (e.g., membrane fouling) shall be listed in the Final Pilot Summary Report.

5.07 TERMINATION CRITERIA

A. Parameters for operation have been determined in the proposal. The system will be operated until primary termination criteria have been met. Primary termination criteria for the pilot study are as follows:

1. Terminal transmembrane pressure

2. Successful operation of the pilot system for 30 days at the specified conditions

B. Additional criteria may be used to terminate a run, including:

1. Exceeding maintenance clean (MC) time (60 minutes/day) or frequency >48 hour limit.

2. Failure to meet water recovery criteria (95% minimum).

3. If there is a shutdown due to a control logic intervention of the unit, the Buyer has the right to terminate the filter run and require a restart. The total acceptable downtime not requiring a restart due to a control logic intervention of the units is 10% (3 days) per run.

4. Exceeding membrane integrity criteria may disqualify a Seller from the project. If more than one repair occurrence is required to maintain the integrity of a membrane, the Buyer reserves the right to exclude that Seller from the project.

**PART 6 -- QUALITY ASSURANCE/QUALITY CONTROL**

Quality assurance and quality control of the operation of the membrane equipment and the measured water quality parameters will be maintained during the *Pilot Performance Testing Program*.

When specific items of equipment or instruments are used, the objective is to maintain the operation of the equipment or instructions within the ranges specified by the Manufacturer or by standard methods. Maintenance of strict QA/QC procedures is important, in that if a question arises when analyzing or interpreting data collected for a given experiment, it will be possible to verify exact conditions at the time of testing.

Equipment flow rates and associated signals should be documented and recorded on a routine basis. A routine daily walk-through during testing will be established to verify that each piece of equipment or instrumentation is operating properly. Particular care will be taken to confirm that any chemicals are being fed at the defined flow rate into a flow stream that is operating at the expected flow rate, such that the chemical concentrations are correct. In-line monitoring equipment such as flowmeters, etc. will be checked to confirm that the read-out matches with the actual measurement and that the signal being recorded is correct.

The items listed are in addition to any specified checks outlined in the analytical methods.

6.01 QA/QC VERIFICATIONS PERFORMED EVERY WEEK:

A. Chemical feed pump flow rates (verified volumetrically over a specific time period).

6.02 QA/QC VERIFICATIONS PERFORMED EVERY TWO WEEKS:

A. In-line flowmeters/rotameters (clean equipment to remove any debris or biological buildup and verify flow volumetrically to avoid erroneous readings).

B. Online Turbidimeters

6.03 QA/QC VERIFICATIONS PERFORMED EACH MONTH:

A. Differential pressure transmitters (verify gauge readings and electrical signal using a pressure gauge).

6.04 PH

A. A 2-point calibration of the pH meter used in this study will be performed once per day when the instrument is in use. Certified pH buffers in the expected range will be used. The pH probe will be stored in the appropriate solution defined in the instrument manual. Transport of carbon dioxide across the air-water interface can confound pH measurement in poorly buffered waters. If this is a problem, measurement of pH in a confined vessel is recommended to minimize the effects of carbon dioxide loss to the atmosphere.

6.05 TEMPERATURE

A. Raw water temperatures will be obtained at least once daily. The thermometer will have a scale marked for every 0.1 °C, as a minimum, and should be calibrated weekly against a precision thermometer certified by the National Institute of Standards and Technology (NIST). (A thermometer having a range of -1°C to +51°C, subdivided in 0.1 °C increments, will be appropriate for this work.)

6.06 MANGANESE AND IRON

A. Hach spectrophotometer low range methods are acceptable.

6.07 TURBIDITY

A. Bench top Hach model with weekly calibration.

6.08 SAMPLE HANDLING

A. The QA/QC procedures of external labs, which are receiving samples as part of this study, should be previously verified and validated by the Buyer. All water quality samples will be shipped in coolers containing appropriate ice packs to maintain sample temperatures of 4°C or less. All sample coolers will contain a Chain of Custody form signed by the sampler, which identifies the sample contained in the cooler, the analyses to be performed, the collection time, and date of shipment. All data generated during the study will be verified, validated, checked for precision, completeness and representativeness, and also for comparability to what is known and documented.

END OF SECTION

# ALDER CREEK WTP UPGRADE, CITY OF SANDY, OR

Inquiry No.: 2002006267 – Sandy Program Management (Envelope 1)

PROPOSAL # U5588

REVISION # 0

DATE 04/11/2024

**SUBMITTED TO**

JENNY COKER, PE
PUBLIC WORKS DIRECTOR OF ENGINEERING
39250 PIONEER BLVD.,
CITY OF SANDY, OR 97055
503.668.6927
jcoker@ci.sandy.or.us

**SUBMITTED BY**

SHAYAN YAGHOUBI
H2O INNOVATION USA, INC.
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VISTA, CALIFORNIA 92081
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# SECTION 1 – COVER LETTER

Dear Ms. Coker,

We would like to thank you for providing **$H_2O$ Innovation USA, Inc.** the opportunity to bid our containerized ultrafiltration (UF) System for the Alder Creek Water Treatment Plant Upgrade Project.

$H_2O$ Innovation USA, Inc., a pioneer of OEM membrane systems, began building systems in 1990 and has since become a major player in North America for municipal and industrial membrane systems. $H_2O$ Innovation has currently over 1,100 employees with annual revenues of $250 million and a strong backlog of projects. Providing exceptional service from six (6) offices and two (2) manufacturing facilities located throughout North America, our reputation as a high-quality membrane system fabricator and customer satisfaction are unparalleled.

We strongly believe there are distinct advantages in having $H_2O$ Innovation USA, Inc. to supply the UF equipment for this project, including but not limited to the following:

1. **Lower Capital and Lifecycle Costs:**
   We are proposing our containerized UF system, called FlexBox, that contains a total of three UF trains supplied in two containers. Each container is capable of producing over 2 MGD of filtrate, as such we only need two (2) containers in total to satisfy the capacity and redundancy requirements per specifications. Minimizing the numbers of containers translates to less footprint requirements, lower capital costs, less chemical and power consumptions, and overall, less moving parts which translate into lower operation and maintenance costs.

2. **Competitive Offer on the UF Membrane Module Warranty:**
   Note that H2OI is proposing a 10-year UF membrane warranty comprised of a 5-year cliff warranty period, followed by a 5-year prorated warranty, instead of the specified 3-year cliff followed by a 7-year prorated warranty in the RFP document.
   Additionally, we are providing NO more than 0.2 percent fiber breaks over the 10-year membrane warranty period instead of the requested 0.5 percent to give additional layer of confidence and insurance coverage to the owner on the UF membrane module we are proposing for this project.

3. **Additional Storage Space in Container:**
   In our base offer, we are proposing one container with two (2) UF skids and a second container with only one (1) UF skid inside to meet the total capacity requirements. As such, there will be sufficient space in one of the proposed containers to store chemicals drums and/or spare parts for easy and fast access.

4. **Flexibility in Design of HMI Screens:**
   Our programming and automation team are flexible in design of HMI screens to better satisfy operators' demands. As such we provide an opportunity for the end user and/or operators to provide feedback on the design of the HMI screens in advance. In the early development stages of the HMI screens, example screen shots will be passed along for review and comment by the customer. After the initial back and forth, we will use those comments to develop a fully functioning simulation of the treatment system. The operators and end users can then access this simulation to test their system out, simulating all aspects of their plant operation before it arrives onsite. We will then incorporate feedback from the simulation testing to create a seamless, user-friendly end product.

5. **System Operation and Maintenance:**
   The use of high-quality equipment, valves and instrumentation ensures smooth plant operation and minimal maintenance. With an experienced O&M division in our company, we understand how to fabricate our equipment with the operator's perspective in mind.

We believe we offer the best value as a partner/supplier for this project, meeting the short term and long-term goals of the City of Sandy, and hope that you view us in the same way. Please do not hesitate to contact me should you have any questions regarding our bid package.

Sincerely,

Shayan Yaghoubi, M.Eng., P.Eng.
Regional Technical Sales Manager
Mobile: (619) 884-5834
shayan.yaghoubi@h2oinnovation.com

# SECTION 2 - SUMMARY OF PROPOSAL REQUIREMENTS

This Technical Proposal document is structured to follow the requirements of the Bid Documents for Alder Creek Water Treatment Plant Upgrade inquiries #2002006267 – SANDY PROGRAM MANAGEMENT.

The following table is a quick reference guide for finding key information requested in the bid documents "Article 6 – Attachment to this Proposal".

| **Article 6.01.A Sealed Envelope NO. 1** | | |
|---|---|---|
| **1.** | **Required Proposer qualifications statement, accompanying information and supporting data, including:** | |
| a. | The completed Proposal Form (Section 00 40 00, Proposal Form) | Refer to Appendix A – Proposal Form<br><br>Also, refer to Appendix X for the completed and signed Responsibility Inquiry Form. |
| b. | The completed Proposal Bond (Section 00 61 27, Proposal Bond) | Refer to Appendix B – Proposal Bond |
| c. | The evidence of the authority to sign. | Refer to Appendix C – Signed Evidence of Authority |
| d. | The draft pilot test plan, per Section 11 30 20, Performance Pilot Testing of Membrane Equipment. | Refer to Appendix I – Draft Pilot Test Plan |
| **2.** | **The Seller (Membrane System Supplier or MSS) company and organization information** | |
| a. | Provide the following information on the Seller (MSS) portion of the parent company, and the parent company itself, as appropriate: | |
| 1) | **PARENT COMPANY** | |
| a) | A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year | Refer to Appendix D – Annual Report for the Parent and MSS Company |
| b) | Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.) | Refer to Section 5.3, section 6, and Appendix S (Corporate Organizational Chart and the WTS Chart). |
| c) | The most recent independent audit report. | Refer to Appendix D (page 40-44 of the annual report) |
| d) | Experience in the municipal water and wastewater treatment industry and evidence of commitment to the municipal market. | Refer to section 6.4.2 and Appendix Q |
| e) | Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company. | 25-674-0531 |
| f) | Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend. | Approximative current revenue for 8 months for Municipal projects: $7.5M CAD.<br><br>The municipal average annual revenue for the past 5 years is approximately $16.3M |

| | | |
|---|---|---|
| | | CAD only on the capital equipment projects within the WTS division. |
| 2) | **Seller MSS COMPANY** | |
| a) | A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year. | Refer to Appendix D – Annual Report for the Parent and MSS Company |
| b) | Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.) | Refer to Section 5.3, section 6, and Appendix S (Company Organizational Chart and the WTS Chart). |
| c) | The most recent independent audit report. | Refer to Appendix D (page 40-44 of the annual report) |
| d) | Documented experience gaining approval for municipal installations through Oregon Health Authority | Refer to Appendix T – The OHA list of approved membranes which includes the Toray HFUG-2020AN modules. |
| e) | A description of the manufacturing facilities, their current and projected capacities; and their ability to meet delivery of 2 MGD systems in 2024- 2025. | Refer to Section 5.3. |
| f) | A minimum of three financial references with phone numbers; and, upon request of the City, each prospective proposer shall provide written authorization for such references to provide financial information to the City. | Refer to Appendix V – Financial References |
| g) | Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company. | 06-326-1412 |
| h) | Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend. | Please refer to the parent company that included the H2O Innovation USA, Inc. |
| b. | **MEMBRANE FIBER AND MODULE INFORMATION** | |
| | a) Identified Membrane Element Manufacturer (MEM) | Refer to Section 6.3, section 3.8.5, and Appendix J – Membrane Module Information |
| | b) Documented experience of MEM treating surface water in western Washington and Oregon | Refer to Section 6.4.3. |
| c. | **MEMBRANE SYSTEM INFORMATION** | |
| | a) A complete list of representative operational installations within previous 10 years. | Refer to section 6.4.2 and Appendix Q |
| d. | Identification and Qualifications of MSS's Project Manager and Resident Representative: | Refer to Appendix P– Resumes of Key Personnel<br>& Section 5.1 of this proposal |
| e. | Proposed Performance Schedule | Refer to section 5.4 |
| f. | **Project Delivery Plan** | |
| a) | Engineering Services as described in Section 01 01 00, Summary of Goods and Special Services | Refer to Section 5.1, 5.2, 5.3, 5.4, and Appendix W (H2OI Quality Document) |
| b) | Fabrication | Refer to section 5.3 |
| C) | Installation Services | Refer to section 5.5 |
| d) | Training | Refer to section 5.6 |
| e) | Commissioning | Refer to section 5.8 |

| | | |
|---|---|---|
| f) | One-Year onsite services as specified in 01 67 00, Acceptance Testing of Membrane Equipment. | Refer to section 5.9 |
| g. | **Verification of Performance Requirements** | |
| a) | Production Capacity | See section 3 of this proposal |
| b) | Membrane System Recovery | |
| c) | Membrane Filtered Water Quality | |
| d) | Membrane Integrity Test System (MITS) | |
| e) | Pretreatment System Compatibility: | |
| **h.** | **Operations Descriptions** | |
| a) | Describe procedures for access, inspection, removal, repair, and replacement of membrane modules. | See section 3.10.7 of this proposal |
| b) | Describe startup and normal operation procedures, as well as methods for maintaining and recovering membrane system permeability (backwashing, maintenance cleans, CIPs, tank draining, etc., as applicable). | See section 3 of this proposal |
| c) | Shutdown/Storage/Startup | See section 3 of this proposal |
| i. | Statement of SCADA Software and Compatibility | See section 4 of this proposal |
| **3.** | **Letter – Payment and Performance Bonds** | |
| | Letter from Proposer's surety company indicating Proposer is willing and able to provide the specified Payment and Performance Bonds. | Refer to Appendix E – Letter from Surety Company – Payment and Performance Bonds and Warranty Obligations |
| **4.** | **Letter – Warranty Obligations Bond** | |
| | Letter from Proposer's surety company indicating Proposer is willing and able to provide a separate bond to cover Warranty obligations through the Warranty period. | Refer to Appendix E – Letter from Surety Company – Payment and Performance Bonds and Warranty Obligations. Note that our surety company does not provide a separate distinct bond to cover warranty obligations for the warranty period because a maintenance bond which covers the warranty period is included in the payment and performance package.<br>We believe the letter included in Appendix E meets the intent of the requirements and would be happy to discuss this post bid upon your request. |
| **5.** | **Insurance Broker Letter** | |
| | Letter from Proposer's insurance broker indicating Proposer is willing and able the specified Insurance. | Refer to Appendix F – Proof of Insurance and COI |
| **6.** | **No Exceptions Letter** | |
| | Letter from an officer of Proposer's firm stating that Proposer takes no exceptions to the Form of Agreement. | Refer to Appendix G - Letter of Acknowledgement – Form of Agreement<br><br>Also, refer to Envelop 2 for our commercial and technical exceptions and clarifications. |
| **7.** | **Complete Copy of Proposal Documents** | |
| | A complete copy of the Proposal Documents, including Addenda. The front cover of each Volume of the Proposal Documents and Addenda shall be signed and dated by the individual designated in the Proposal Form. The documents shall be otherwise unaltered. | Refer to Appendix H – Copy of Proposal Documents. We included a front cover page of the Envelope 1 and Envelope 2 proposals along with the first page of each addendum, signed and dated. Additionally, we acknowledged receipt of addenda in proposal form (Appendix A). |

# SECTION 3 – UF TECHNICAL APPROACH

## 3.1 SYSTEM OVERVIEW

The Containerized UF water treatment plant (WTP) will be installed at the new Alder Creek Water Treatment Plant in the City of Sandy, OR.

The WTP will use Alder Creek as source water. The water system will have a firm capacity of 2.0 MGD. The term 'firm capacity' means that the capacity can be achieved with one membrane unit out of service. A membrane unit (or UF train) shall consist of a membrane module rack, dedicated feed pump and dedicated strainer, and is capable of independent operation, setpoints and control.

Water will be obtained from Alder Creek using a fixed-level intake (not by H2OI). The raw water will be coagulated with polyaluminum chloride (PACL) or aluminum chlorohydrate (ACH), dosed with sodium hydroxide for pH control, and sodium hypochlorite added for oxidation, and will pass through a static mixer (all by others). As specified, the purpose of coagulation/flocculation is to coagulate and remove natural organic matter (NOM) and color to comply with the regulatory requirements for disinfection byproduct (DBP) control. Coagulated raw water will be stored in the MF Feed Tank (by others) outside of the containerized membrane systems and will receive at least two-minute reaction time before entering the membrane feed pumps (feed pumps located in H2O Innovation's containers).

The raw water will enter the containerized membrane systems under hydrostatic pressure available from the MF Feed Tank. Note that it is assumed there is appropriate static head available in the MF Feed Tank to ensure flooded suction conditions to the membrane feed pumps. Membrane feed pumps located inside each containerized system, will pump water through automatic backwashable strainers that are designed to remove deleterious materials.

The membrane system will be pressure-type. Water will pass through a unit modulating influent control valve and enter the treatment unit. Water is filtered across the membrane using differential pressure. The filtered water is then discharged.

The treatment system proposed for the UF membrane filtration system includes three (3) UF membrane filtration trains to achieve a firm capacity of 2.0 MDG with any set of 2 trains. Two (2) of which will be installed inside container 1 while the third train will be installed in container 2. A redundancy of 50 % is thus included as the plant capacity can be met with one (1) train out of service.

UF membrane trains will each be equipped with 28 Toray HFUG-2020AN membrane modules installed with spaces for 34 modules per train to provide a minimum of 21.4 % spare space.

Each train has a dedicated feed pump and automated strainer as pre-treatment. Both the UF feed pumps and automatic strainers are sized to accommodate UF trains fully populated with membranes at the design flux.

Each UF system container will be pre-assembled with a CIP system complete with vertical centrifugal CIP pump, a stainless-steel CIP tank with in-tank heater, an air compressor system, complete with an oil-free scroll type air compressor with dedicated air dryer and a receiver tank

and Chemical transfer pumps (Sodium hypochlorite, Sodium bisulfite, Citric acid, Caustic) for CIP and neutralization.

In addition to the above, $H_2O$ Innovation will be providing a detailed control strategy and control software.

## 3.2 UF FEED WATER QUALITY

The proposed membrane filtration system has been designed to treat the water quality outlined in the Bidding Documents. The UF membrane systems have been designed to deliver the rated design capacity while experiencing the full range of specified feed water constituent concentrations, including turbidity and TOC in the RFP document.

## 3.3 UF TREATED WATER QUALITY

The guaranteed filtrate water quality for the UF system is as follows:

| Guaranteed[1] Permeate Quality | Value |
|---|---|
| Turbidity | ≤ 0.1 NTU 95% of the time |
| Turbidity | ≤ 0.15 NTU 100% of the time |
| LRV (MIT performed once daily) | > 4 Log |

1. Performance warranty and membrane warranty are provided in Section 4.5.

## 3.4 UF MEMBRANE SYSTEM CONFIGURATION

The following table outlines the proposed configuration for the UF membrane trains as proposed.

| Description | Installed Capacity | | Expanded Capacity (Additive Bid Item) | Unit |
|---|---|---|---|---|
| | Per train | Plant N+1 | Plant N+1 | |
| Maximum instantaneous Feed to UF | 833 | 1666 | 2678 | gpm |
| Net treated filtrate design flow (N+1) | 1.0 | 2.0 | 3.21 | MGD |
| Water temperature at design flow | 5 | 5 | 5 | Deg C |
| Nominal operating recovery | 95 | 95 | 95 | % |
| Total # of trains installed | 1 | 3 | 4 | - |

| | | | | |
|---|---|---|---|---|
| Total # of trains operating | 1 | 2 | 3 | - |
| Instantaneous flux | 44.2 | 44.2 | 44.2 | gfd |
| Net flux | 36.8 | 36.8 | 36.8 | gfd |
| # of modules installed per train | 28 | 28 | 30 | - |
| Total # of modules installed | 28 | 84 | 120 | - |
| Total # of module spaces | 34 | 102 | 136 | - |
| Spare space per train | 21.4 | 21.4 | 11.3 | % |
| Area of membrane module | 969 | 969 | 969 | $ft^2$ |
| Total Membrane area installed | 27,132 | 81,396 | 116,280 | $ft^2$ |

## 3.5 PROOF PILOT TESTING FOR HFUG-2020AN MODULES

The proof pilot testing for HFUG modules will be performed using H2O Innovation's UF Pilot system. The proposed pilot system perfectly meets the UF design requirements listed in the RFP document. Pilot P&IDs and the pilot skid specification sheet are provided in **Appendix K**.

## 3.6 UF FLUX JUSTIFICATION

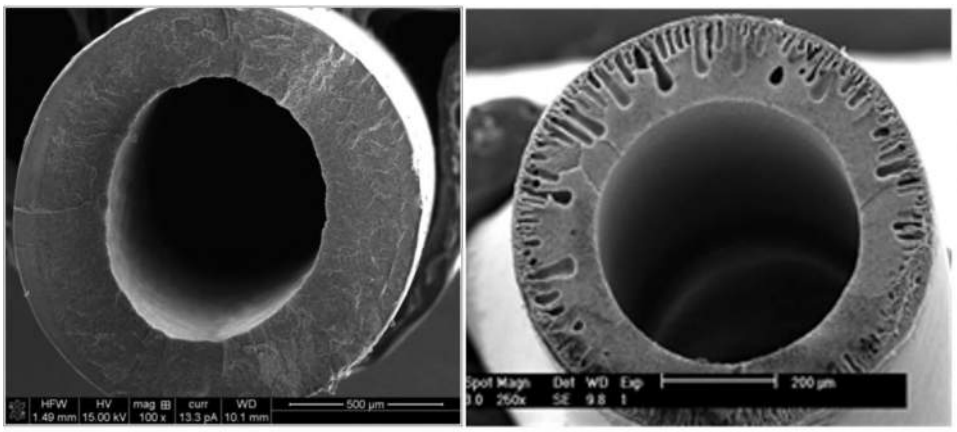
A conservative maximum instantaneous flux rate of 44.2 gfd at a nominal recovery of 95% has been selected for our UF system design. In addition, the maximum net flux is 36.8 gfd which translates to a conservative instantaneous flux coefficient of 1.20. It is important to note that these fluxes are aligned with and more conservative than the listed flux in the RFP document (50 gfd maximum instantaneous flux). Based on H2O Innovation's experience with similar water quality supplies at similar operating temperatures, we are fully confident that our proposed maximum instantaneous flux is conservative to ensure steady and reliable operation for years to come.

## 3.7 UF DESIGN ROBUSTNESS, ABILITY TO HANDLE SOURCE WATER VARIABILITY

### 3.7.1 MEMBRANE SELECTION

At the heart of the membrane filtration system is the membrane fiber. Our proposed design includes the Toray membrane, which is manufactured using TIPS (Thermally Induced Phase Separation) technology to produce a fiber that is both more resistant to fouling and stronger than a NIPS (Non-solvent Induced Phase Separation) fiber. The strength of the fiber is a key factor in membrane performance battling wide range of foulants (organics, solids, etc). TIPS manufactured fibers have a high tensile strength without needing a braid for mechanical strength. Generally speaking, TIPS membranes are manufactured by cooling the polymer while NIPS fibers are made by coagulating the polymer in a non-solvent. More polymers can be dissolved at high temperature, creating a stronger fiber with more "density". Thermodynamically speaking, heat diffuses faster through the fiber wall than the solvent can during fabrication. This means the fiber is fabricated

quicker, with a more homogeneous pore structure with a TIPS process such as Toray's. While products are specific to each manufacturer, the fiber on the left is from Toray while the fiber on the right is an example of what a NIPS fiber can look like:



Toray Fiber NIPS Fiber

The proposed Toray membranes have demonstrated industry leading performance in terms of treated water quality and resistance to fiber breakage.

Membranes manufactured using the TIPS process are also more resistant to chemicals. This is especially useful for a plant treating surface water high in organics (TOC), because it allows for higher concentrations of sodium hypochlorite to be used, if necessary, to clean the membranes in the case of feed water quality excursions. Toray membranes can handle up to 5000 mg/L of sodium hypochlorite and a pH range of 1-14, allowing for both high pH (pH >12.5) and low pH (pH <2) cleans to be done in the case of unexpected fouling in the plant.

Finally, the membranes selected for the City of Sandy WTP are ultrafiltration membranes with a pore size of 0.01 microns. With membrane manufacturing the pore size is not absolute but a nominal value, with some pores larger and some smaller. Due to the TIPS manufacturing process, the pore size distribution is very narrow and tighter – see the voids visible on the NIPS fiber example above. No membrane is eternal, and they all suffer abrasion and surface damage over time. Having a very narrow pore structure with a TIPS fiber helps maintain water quality by not having large pores that can be present on the outer surface of the membrane. This results in better long-term rejection of colloidal particulate matter over the years and lower fouling due to very limited pore plugging as compared to a membrane with a larger pore size distribution.

### 3.7.2 OPERATING PROCESSES

The design for the City of Sandy UF membrane system is robust, conservative, and in line with listed specifications in the RFP. The operating recovery was carefully evaluated based on the feed water quality indicated in the bid documents.

We have also sized our major ancillary equipment to provide a boost in cleaning performance during possible upset feed conditions, including:

- Backpulse during backwash. Our typical backpulse factor is a multiplier of 1.1 times the forward flux rate. For the City of Sandy UF system design we have sized our backpulse equipment to handle a backpulse multiplier of 1.3 times the filtrate production rate even though 1.1 multiplier will be used. This added backwash capacity will ensure efficient remove of solids from the fiber bundle and effective evacuation through the reject port of the membrane module if required.
- Air scour during backwash. Normally we would target an aeration rate of 3.5 scfm per module for the air scour step during the backwash sequence. For the City of Sandy UF membrane system, we have sized our compressed air system to deliver an enhanced air scour rate up to 5 scfm. This extra air flow ensures reliable and effective solids removal to handle upset feed conditions.

In addition, during upset events, the proposed membrane system has the ability to provide aerated drains as part of routine backwashing. Normally, during the drain step of the backwash sequence, no air scour would be applied; however, during higher feed turbidity, the additional aeration step increases the module's ability to evacuate solids from the fiber bundle. These features can be selected by the operator at the HMI.

In terms of membrane system cleaning, we have selected a design flux that does not require aggressive chemical cleaning during typical operating conditions. As a result, in the event that upsets do occur, there is flexibility in operation to facilitate additional cleaning events if needed.

As a part of our engineering submittal package, $H_2O$ Innovation would provide a complete operating strategy within the Operations and Maintenance Manual to assist the operators in dealing with potential upset events.

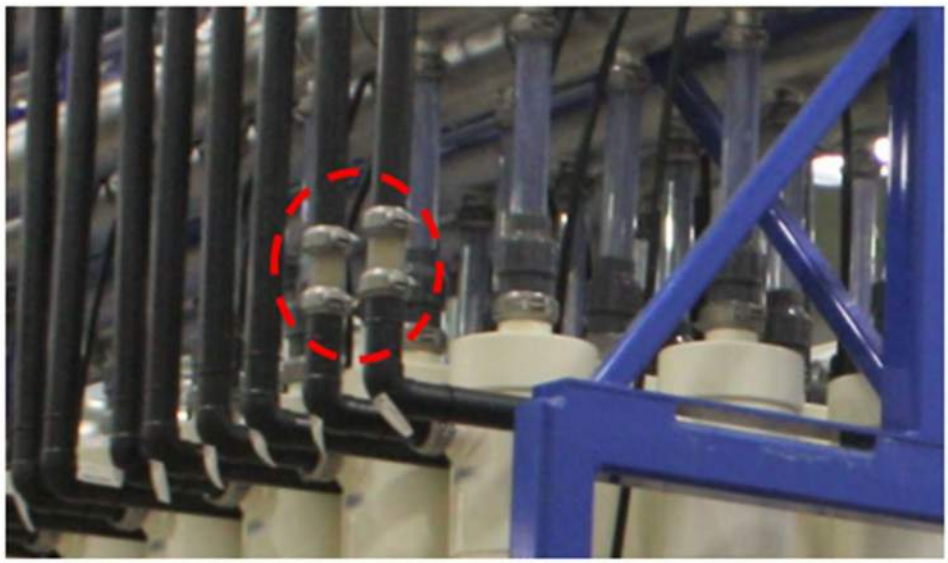
## 3.8 UF SYSTEM DESIGN IMPROVEMENTS AND VALUE ENGINEERING

In order to improve the UF system performance and to reduce the system capital cost, we present below options for value engineering (VE) and design improvement (DI).

### 3.8.1. VISUAL PERFORMANCE INDICATORS: CLEAR BACKWASH MANIFOLDS

An added feature not required by the specifications but included with the proposed system is clear backwash waste module sections at the beginning and end of the membrane rack. We added this feature to allow the commissioning team and operations staff to confirm the aeration pattern on the rack, optimize the operation and monitor the backwash step. This “window” into the operation of the UF system will allow us to adjust timers with a visual confirmation for optimum performance. This may not be done by others, but we have found ensuring uniform air distribution to be crucial for stable and long-term operation. In the picture attached you can see the high solids content being pushed out during a backwash, providing visual confirmation of what is being evacuated during the steps and insight into the performance of the step.

The additional photo below provides context of where these indicators are located.



### 3.8.2 EXTRA UF RACK CAPABILITY

The project demands N+1 trains/racks, and H2O Innovation’s pre-engineered container can hold 2 trains per container. As 2 trains have enough capacity to meet the 2.0 MGD requirement, three

trains are offered as base bid. A fourth train could expand plant capacity by 50%, from 2.0 to 3.0 MGD while maintaining N+1 configuration.

Each UF train is proposed to include 28 installed membrane modules and have 21.5 % spare capacity (6 spare spaces). Additional capacity can be provided by adding an extra 2 modules per train (30 installed membrane modules) while still respecting H2O Innovation's internal design policy of having at least 10% spare space. Please refer to the table included in Section 3.4 under the "Extra Capacity" column for further information.

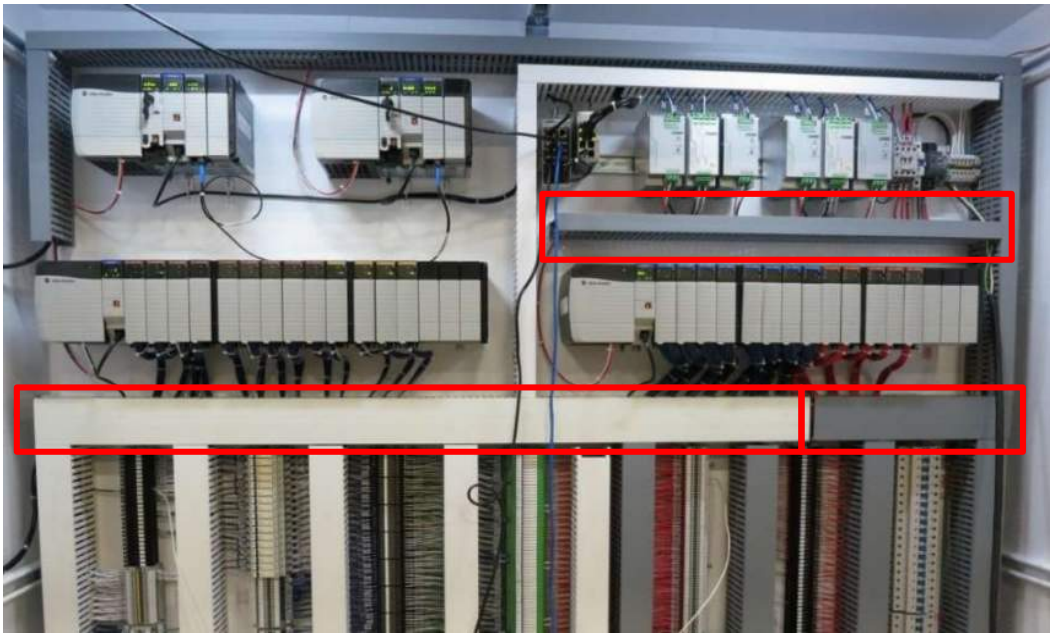
### 3.8.3 NO NEED FOR AN ADDED NEUTRALIZATION SYSTEM

H2O Innovation's Flexbox Containerized UF systems are each configured and sized with a CIP system that combines automated CIP and Neutralization functions.

As backpulses are not chemically enhanced, no neutralization is required during this process. Because our backwash sequence is completely chemical-free, no neutralization steps are needed after backwashing.

### 3.8.4 CONTROL PANEL DESIGN

In each of $H_2O$ Innovation's custom panels, we offer a section of the panel only for 120V and a separate section for 24V. All our panels distinguish between the two by having 120V within white paneling and 24V within gray paneling. In addition, we always include a RJ45 connection that is on the outside of the panel so that connecting to the system with a computer does not require having to open the panel. This is a safer approach than working with a live and open panel.



### 3.8.5 SUPERIOR MEMBRANE MODULE WARRANTY

H2OI is proposing a 10-year UF membrane warranty, comprised of a 5-year cliff warranty period, followed by a 5-year prorated warranty, instead of the specified 3-year cliff followed by a 7-year prorated warranty in the RFP document.

Additionally, we are providing no more than 0.05% fiber breaks per year or no more than 0.2% fiber breaks over the 10-year warranty period instead of the requested 0.5 percent to give additional layer of confidence and insurance coverage to the owner on the UF membrane module we are proposing for this project.

### 3.8.5 SUITABLE FASTENERS AND MISCELLANEOUS METAL COMPONENTS MATERIAL

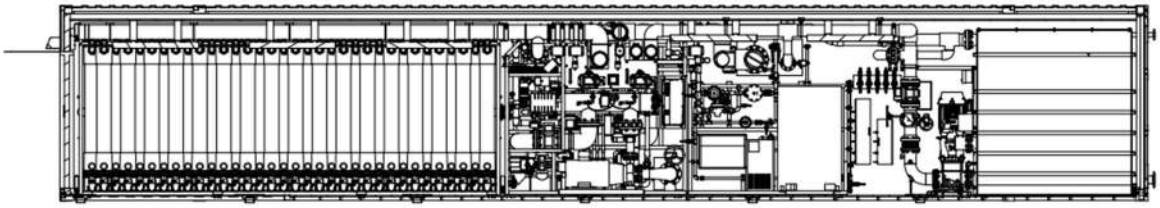
Addendum 5 added ductile iron as acceptable material for fasteners as listed in section 11 30 00, clause 2.02.A.2.b.

Even with proper ventilation, in a containerized environment with water treatment units and the use of acid and chlorine makes ductile iron unsuitable for long-term use.

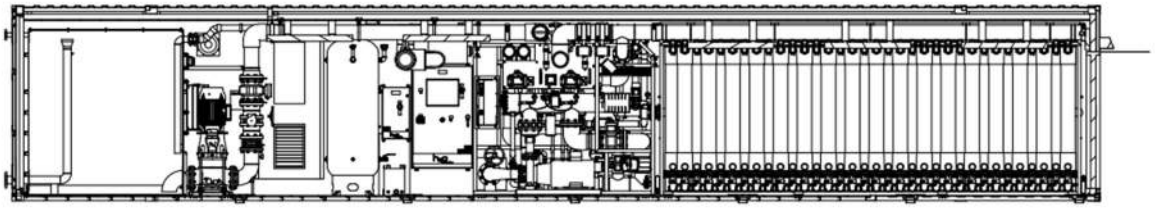
H2OI choice of material is SS316 for fasteners such as bolts, nuts, washers, flange backing rings, and other Bolts, nuts, washers, flange backing rings, and other miscellaneous metals not specifically addressed elsewhere in the specifications.

## 3.9 UF CONTAINER LAYOUT

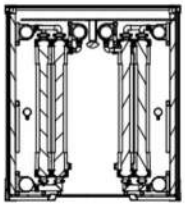
**Appendix M** – Container General Arrangement Drawing shows the footprint of a Flexbox Containerized UF system will full membranes installed (also pictured below).



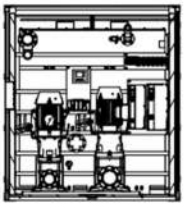
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

## 3.10 UF FUNCTIONAL PROCESS DESCRIPTION

### 3.10.1 PRODUCTION

During production, the feed water is pushed through the ultrafiltration modules using the supplied feed pressure of the membrane feed pumps. The modules proposed have a chlorine-resistant PVDF chemistry and operate in an outside-in configuration to maximize filtration surface and minimize footprint. The water sent to the modules needs to be pre-filtered and this is accomplished through automatic strainers.

The production and backwash processes are both batch operation and alternate based on the backwashes triggered by the recovery set point. The production continues until the volume produced during the filtration cycle is equal to multiple of the individual backwash waste volume. For instance, at 95% recovery, the volume accumulated during the production cycle is equal to

19 times that generated during the backwash waste. Filtration cycle durations are typically between 30 and 90 minutes. For City of Sandy WTP UF membrane system, a recovery rate of 95% is applied.

The system has been designed with an instantaneous factor that accounts for offline time and lost filtrate associated with backwashing and maintenance cleans. Therefore, the train normally operates at a higher instantaneous production rate to compensate for the required waste filtrate and non-production time. This way the train is still able to meet the net daily capacity requirements. As a train leaves production for either backwash or MIT/MC/CIP, the remaining trains do not ramp up which results in a variable filtrate flow rate, but the required net filtrate production is met on a daily basis. The following offline events are considered mutually exclusive: MIT, MC and CIP.

As a means to optimize UF operation and shave peak flux requirements, all trains will typically run provided they are available to do so and providing there is appropriate demand.

The generic definition of the instantaneous flux is as follows:

$$Instantaneous\ Flux\ (gfd) = \frac{Gross\ Permeate\ Production\ (gal)}{Filtration\ Surface\ (ft^2) * Production\ Time\ (day)}$$

With more details:

$$Instantaneous\ Flux\ (gfd) = \frac{Net\ Permeate\ Production\ (gal) + Permeate\ produced\ \&\ wasted\ (gal)}{Filtration\ Surface\ (ft^2)}$$

### 3.10.2 BACKWASH

The membranes will operate in batch mode and always in a dead-end configuration (without recirculation or concentrate bleed). The train will alternate between permeation and backwash steps typically every 30-60 minutes. The duration of the permeation step will be calculated by the PLC and backwashes will be triggered when the recovery is reached. Operators will also have the ability to trigger a backwash manually out of sequence.

With a design recovery of X %, the concentration factor on the system is (1/(1-X). If the backwash creates a waste volume ***V***, then the recovery will be achieved when the feed volume setpoint of (1/(1-X)) ***V*** is met between backwashes. If we take a recovery of 95% as the example, the calculations give:

- Total feed = 20 ***V***
- Permeate produced = 19 ***V***
- Backwash waste = 1 ***V***.

Therefore, in this example, 19 volumes of water are recovered for every 20 volumes of feed, leading to a recovery of 95%.

The backwash waste volume will be entered as a constant in the PLC and the production volume will be cumulated until the required permeate volume has been sent to the treated water storage tank. When that volume is produced, the train will go into a backwash. Depending on the plant capacity, and therefore operating flux on the trains, the time to reach the time to reach the required volume permeated to trigger a backwash will vary. As such, permeation cycles will shorten as the flux increases and they will last longer as the capacity decreases. This scheme is implemented to ensure that the recovery does not decrease at lower capacities and to maintain the water efficiency of the plant throughout its entire plant operating range.

The main backpulse steps are described below:

- Backpulse: Water is pumped from the backpulse supply tank and into the modules in the reverse direction (from the inside of the lumen to the outside) using the backpulse pump. During this step, the module side port is opened to evacuate the excess water and a small fraction of the solids that have to be removed to prepare the module for its next filtration cycle.

- Air scour: Low pressure air from the compressed air system, is injected at the bottom of the modules on the feed side of the membrane to provide additional turbulence thanks to the two-phase flow to help in dislodging the solids from the fiber bundle. During this step the module side port remains open and acts as a vent for the air being bubbled in the water on the side of the modules.

- Drain: This last step ensures that solids, which could not be evacuated and pushed up to the top of the module, through and across the fiber bundle and into the side port, are removed from the module. This step is critical in maintaining the solid tolerance of the module, and their ability to handle high turbidities and process upsets. It is easier to evacuate solids through the bottom of the modules, where large holes are present to introduce the feed water. It is a lot more difficult to try to push and evacuate the backwash waste solids across the tight spaces in fiber bundle when using the side port at the top of the module.

Please note that $H_2O$ Innovation normally performs non-chemically enhanced backwashes.

The main backwash steps and parameters are listed below:

| Parameter | Value | Unit |
|---|---|---|
| Flux | 1.1 to 1.3 x permeation | gfd |
| Backpulse duration | 30 | s |
| Air scour duration | 30 | s |
| Module drain | ~ 45 | s |
| Air scour flow rate | Module specific | Acfm/module at less than 10 psi |
| Duration of backwash cycle | 4.0 | min |
| Chemical Introduction in Backwash Cycle | N/A | N/A |

Please note that because the UF trains rely on a gravity drain step as part of the backwash sequence, the drain connections leaving the UF containers must be appropriately sized to facilitate a free gravity drain with zero backpressure on the line.

### 3.10.3 CIP / NEUTRALIZATION SYSTEM

The Clean-In-Place system of each container includes a CIP pump and a CIP tank with immersion heater. The CIP loop is operated using automated valves that perform a recirculation loop around the CIP tank and/or around the membranes for both feed and filtrate side cleaning. The CIP tank is designed with spare volume to allow neutralizing the CIP solution as well as the first flush following a MC or RC sequence. Additional rinsing and subsequent neutralization can occur if needed to suit the application.

The main differences between maintenance clean and recovery clean are described in the following table. Where commonalities are, the columns are merged, as the description applies to both types of cleans.

| | Maintenance Clean | Recovery Clean |
|---|---|---|
| Frequency | 72h | Monthly + |
| Duration | 30 min | 5 hours |
| Heated | No | Yes (typically) |
| Chemical Concentration | Low | High |
| Temperature | Ambient water | 40 deg C |

| | | |
|---|---|---|
| | temperature | |
| Pumping Requirements | 30 gfd x the number of modules | 30 gfd x the number of modules |

The chemicals are required to be stored at appropriate temperatures per water industry best practices.

Sodium Hypochlorite is used when there is organic fouling. Since organic fouling is more common than in inorganic fouling, most maintenance cleans for projects are sodium hypochlorite-based only.

Citric acid is used when there is inorganic fouling, such as calcium carbonate scaling. It works better than a simple acid due to its chelating properties.

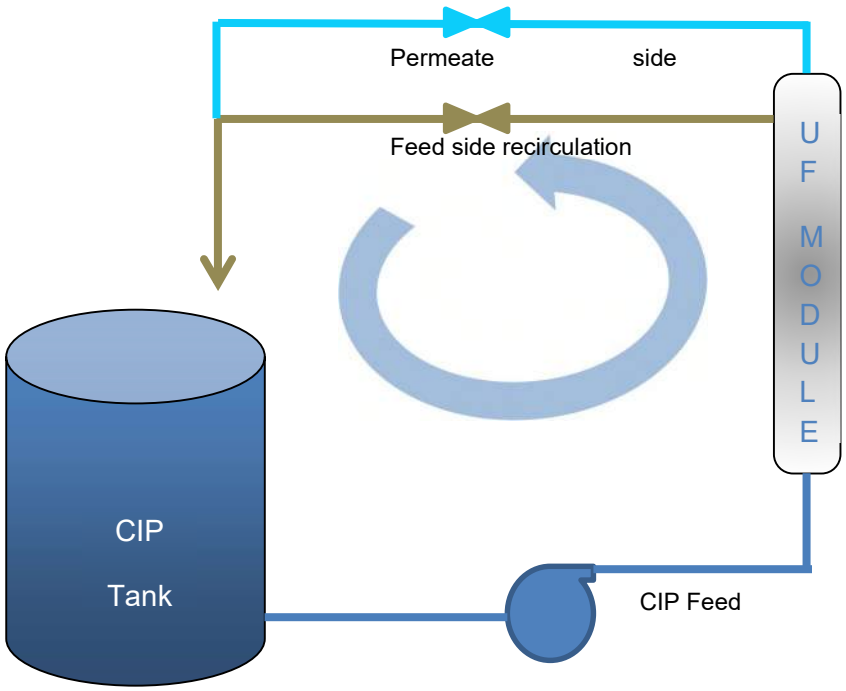
Further details are outlined below on the MC and RC processes.

### MAINTENANCE CLEANS

Maintenance cleans are short term cleans implemented on a schedule that is inputted by the operator at the HMI. As their name suggests, they are performed to maintain the membrane's permeability and extend it to lengthen the interval between recovery cleans. The following maintenance cleaning protocol will be implemented:

| Maintenance cleaning regime | Value | Unit |
|---|---|---|
| Recirculation flux per module | 30 | gfd |
| Total Recirculation time: | 15 | min |
| - Recirculation step 1: feed side recirculation | 100 | sec |
| - Recirculation step 2: Relaxation | 50 | sec |
| - Recirculation step 3: permeate side recirculation | 100 | sec |
| - Recirculation step 4: Relaxation* | 50 | sec |
| Rinse step (with feed water) | 10 | min |
| Overall duration | 30 | min |
| Heating of cleaning solution | None | - |

Note: recirculation steps 5 to 8: Repeat steps 1 to 4 for the same durations for a total time in recirculation mode of 15 minutes. Overall duration does not include neutralization steps. Additional rinsing with subsequent neutralization may be required depending on the application.




Maintenance cleans are carried out by simply recirculating the CIP solution on the feed side of the membrane through the bottom port injection. Once the chemical solution enters the module, it is alternatively directed to either the side backwash waste port for a "*feed side recirculation*" or through the permeate port for a "*permeate side recirculation*". This double recirculation for the cleaning solution is another advantage of our consolidated cleaning methodology, compared to other configurations that may not use it. This provides enhanced ability to scour the solids away from the module casing as well as promote contact of the cleaning solution within the lumen. This is directly inspired from the vast experience in RO systems cleaning. RO vessels are all cleaned from the concentrate and permeate side.

Permeate will be introduced at the bottom of the module and recirculated at a flux of 30 gfd using the CIP pump. The recirculation will last 15 minutes, during which the permeate and backwash ports will alternately open to clean both the inside and outside of the fibers. A brief relaxation is included after each recirculation step. Once the recirculation phase is over, the rack is rinsed out using feed water.

Following the recirculation steps, the membrane rack is then rinsed using feed water. The rinse water is also returned to the CIP tank for neutralization and disposal. Adding rinsing and neutralization steps can be accommodated to suit the application. After rinsing, the cross connection control valves are opened and feed water is introduced back into the membrane rack and the train is again ready for production.

### Recovery Cleans

Recovery cleans operate in the same fashion as Maintenance Cleans, but are long term cleans implemented on a schedule varying from monthly to quarter-annually. Recovery cleans can also be heated or non-heated. The duration, chemical concentration, and heating option are the only differences between Maintenance Cleans and Recovery Cleans.

The following recovery cleaning protocol will be implemented:

| Recovery cleaning regime | Value | Unit |
|---|---|---|
| Recirculation flux per module | 30 | gfd |
| Total Recirculation time: | 300 | min |
| - Recirculation step 1: feed side recirculation | 15 | min |
| - Recirculation step 2: Relaxation | 15 | min |
| - Recirculation step 3: permeate side recirculation | 15 | min |
| - Recirculation step 4: Relaxation* | 15 | min |
| Rinse step (with feed water) | 10 | min |
| Overall duration | 300 | min |
| Heating of cleaning solution | Yes | - |

Note: recirculation steps 5 to 8: Repeat steps 1 to 4 for the same durations for a total time in recirculation mode of 300 minutes.

Typically, water will be heated to 40°C (104°F) for both the hypochlorite and acid CIPs to enhance the cleaning efficiency. During the heated CIP, heated cleaning solution from the CIP tank will be sent to the modules using the CIP pump and recirculated back to the CIP recirculation loop. During the recirculation step, both permeate and concentrate ports on the module will be opened. The outside cross flow will manage the concentration polarization on the outside of the fibers. The inside (permeation) flow through the fiber lumen will force the chemical solutions through the pores and into the inside of the fibers.

This dual flow pattern, with water flowing around the membrane and through it, is the same that has been in use for many years in reverse osmosis systems and that has proven its efficiency and benefits in that technology.

After less than 5 hours of recirculation, the cleaning solution is removed from the rack by displacement using feed water to rinse the modules and piping. The remaining steps are similar to the previously outlined maintenance clean procedure .

The cleaning intervals can be lengthened at lower capacities based on the performance of the system.

### 3.10.4 DIRECT MEMBRANE INTEGRITY TESTING

The system has been designed to accommodate the requirements for daily Membrane Integrity Test (MITs). The MIT pressure will be based on the membrane's contact angle and a test pressure sufficient to ensure a test resolution of 3 μm. All MIT procedures and associated LRV calculations will be performed in full compliance with the USEPA's Membrane Filtration Guidance Manual. The test pressure will be calculated as follows (Equation B.1 in USEPA MFGM):

$$P_{BP} = \frac{4 * \sigma * \cos\theta}{d_{cap}}$$

Where:

$P_{BP}$ = Bubble point pressure (Pa)

$\sigma$ = surface tension at the air-liquid interface (N.m-1)

$\theta$ = liquid-membrane contact angle (deg)

$d_{cap}$ = capillary diameter (m)

However, the safe bubble point pressure is defined by using the highest surface tension at 0°C (0.0749 N/m), the membrane module's contact angle and a defect or breach size of 3 μm as per the resolution requirements on the LT2ESWTR.

The MITs are performed in an outside-in configuration whereby the feed side of the fibers is pressurized with compressed air. The inside of the fibers is left with permeate as the presence of water in the fiber lumen is required for the identification of the leaky modules by the operators. A clear section of piping is provided on the permeate side of each module and when fiber breaches are present, operators can easily identify the module to be repaired by visually locating which modules the bubbles are coming from during the MIT. Without that water on the permeate side, leaky module identification would not be possible. However, requiring this permeate on the fiber lumen during the MIT adds backpressure that needs to be compensated.

The integrity tests will take place as follows:

- 5 minutes of pressurization to purge the water from the feed side of the modules, reach and equalize the pressure in the train
- 5 minutes of pressure decay monitoring. The beginning and end pressures will be recorded and, along with other parameters, used to calculated the LRV associated with the latest integrity test
- 5 minutes of air purge to release the pressure, purge the air out and bring water back into the train.

All the modules within a train will be tested at the same time. The pressure transmitter installed on the feed side of the membrane and used to calculate the TMP will be used to monitor the pressure decay. As per your requirements, the system will issue an alarm when the Cryptosporidium or Giardia removal is less than 4 log as measured by DIT As such, the following thresholds will be implemented:

- Alarm and automatic shutdown at < 4 Log

In case of an MIT/LRV failure with the results less than 4, the train stops production. The operator will then have to manually initiate another MIT to locate the leaks through the clear sections of piping (unless he has already witnessed the test and identified the leaks in the first test).

The LRV calculations will be done according to the USEPA Membrane Filtration Guidance Manual. Their results are used to calculate the integrity of the membrane based on a set of calculations and the results of the MIT. MITs would typically be done once per day per train.

### 3.10.5 INDIRECT INTEGRITY MONITORING

The indirect integrity monitoring will be accomplished by turbidimeters installed on the permeate discharge of each train. While in production, the permeate turbidity will be monitored and the following programming triggers will be in place:

- Alert: 0.1 NTU
- Alarm and automatic shutdown: 0.5 NTU

We will supply HACH TU5300 Series laser turbidimeters on the permeate of each train. Each turbidimeter will be equipped with a solenoid isolation valve to isolate the train when it is not in permeation. The internal degassing system of the turbidimeter and the fact that the membrane works under pressure are sufficient (no bubble created such as on an immersed system). An isolation valve will be installed to ensure that the train piping does not drain through the turbidimeter during a shutdown.

### 3.10.6 FIBER REPAIR PROCEDURE

If a fiber needs to be repaired, the leaking fiber must first be identified. To do so, the following procedure takes place (note, for convenience, this procedure can be performed with leaving the module in-situ if the operator prefers):

(1) Perform a pressure decay test and observe which modules have leaks by observing air bubbles in the clear module permeate connection spool.
(2) After marking the leaking module(s), open the drain valve.
(3) Disconnect the permeate piping from the specified module and open the upper cap of it as shown below.

(4) A belt wrench is necessary to open the upper cap as shown below.

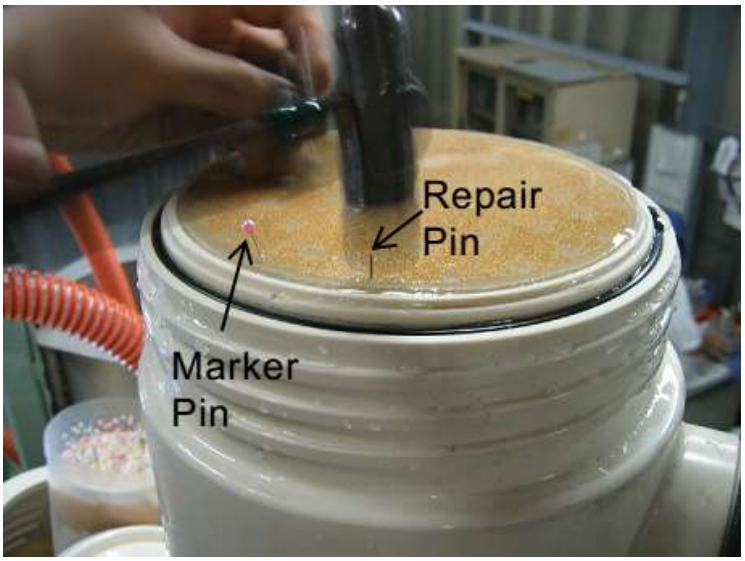
(5) Place a cylindrical frame or glue a tape on all circumferences of the upper end of the module as shown below:


(6) Fill upper end of the module with water.

(7) Slowly introduce pressurized oil free air (lower than 50kPa) into the feed side of the module.
(8) Wait one minute then observe bubble formation on the upper end of the module. Compromised membrane fibers show large continuous bubble formation. Small bubbles are common and a result of air diffusion through membrane pores.
(9) If compromised membrane fibers are detected, “mark” them by plugging with a “marker” pin.
(10) After marking all compromised membrane fibers, shut off air supply and bleed air from the module

Once the compromised fiber has been identified, a repair can be made by following the steps below:

(1) The module should be drained off and the “marker” pin(s) is (are) marked with compromised membrane fiber(s). Replace the “marker” pin(s) with repair pin(s) as shown below:




(2) Hammer the repair pin(s) into the membrane fiber(s) completely.
(3) Glue the repair pin(s) to the membrane fiber(s) using Toray’s specified epoxy adhesive and hold the modules for three hours for curing.
(4) Repeat the specifying test until no leakage is detected.
(5) Close upper cap of the module(s) and joint permeate water piping with the module(s).

## 3.11 UF O&M CALCULATIONS

### 3.11.1 CHEMICAL CLEANING FOR UF AND RO SYSTEMS

The proposed cleaning recipe for the UF system is outlined in the following table.

| Type of Clean | Cleaning Concentration (mg/L) | Frequency[1] |
|---|---|---|
| Sodium Hypochlorite MC | 150 | 1/72-hours |
| Sodium Hypochlorite RC | 1,000 | 30 days |
| Citric Acid RC | 2,000 | 30 days |

Note:

1. Cleaning frequency is per train and applies at the rated design flow condition.

# SECTION 4 – SCOPE OF SUPPLY

To provide clarity on the scope of supply we have proposed for the UF systems, please see the scope tables below for each piece of equipment as referenced on the P&IDs. Preliminary P&IDs have been included in **Appendix L** to identify H2O Innovation's scope of supply and are to be reviewed in conjunction with the following tables. Equipment, instruments, and valves for the Containerized systems are also detailed in Appendix L. All equipment not described below is entirely by others.

## 4.1 CONTAINERAIZED ULTRAFITRATION PACKAGE SCOPE TABLE

| Ultrafiltration Modules (P&ID Sheets 0300, 0310) | Quantity | Quantity of Equipment | By $H_2O$ | By Others |
|---|---|---|---|---|
| UF trains | 3 | | ✓ | |
| Equipment (Per train): | | | | |
| UF End-suction centrifugal feed pump with VFD | | 1 | ✓ | |
| Automated Strainer | | 1 | ✓ | |
| Instruments as shown on P&IDs | | Lot | ✓ | |
| Valves as shown on P&IDs | | Lot | ✓ | |
| Associated SCH10 316SS, PVC SCH80 & HDPE Piping as shown on P&IDs | | Lot | ✓ | |
| Associated PE tubing for air supply to skidded pneumatic actuators | | Lot | ✓ | |
| Associated wiring within Container boundary | | Lot | ✓ | |
| Loose Shipped Equipment: | | | | |
| UF Modules (28 per train) | | 84 | ✓ | |
| Installation loose shipped equipment | | - | | ✓ |
| Supply and installation of associated piping and wiring outside Containers | | - | | ✓ |

| Ancillary Equipment | Quantity | Quantity of Equipment | By $H_2O$ | By Others |
|---|---|---|---|---|
| Containerized Units | 2 | | ✓ | |
| Equipment (Per Container): | | | | |
| CIP tank | | 1 | ✓ | |
| CIP tank immersion heater | | 1 | ✓ | |
| Centrifugal Vertical CIP Pump with VFD | | 1 | ✓ | |
| Backpulse Tank | | 1 | ✓ | |
| Centrifugal Vertical Backpulse Pump with VFD | | 1 | ✓ | |
| Air compressor system as shown on P&ID | | 1 | ✓ | |
| Instruments as shown on P&IDs | | Lot | ✓ | |
| Valves as shown on P&IDs | | Lot | ✓ | |
| Associated PVC SCH80 Piping headers as shown on P&IDs | | Lot | ✓ | |
| Associated PE tubing for air supply to skidded pneumatic actuators and membrane racks | | Lot | ✓ | |
| Associated wiring within Container boundary | | Lot | ✓ | |
| Supply and installation of associated piping and wiring outside Containers | | - | | ✓ |

In addition, four (4) duplex chemical skids are supplied loose shipped for installation by the contractor outside of the containers. Skids include: sodium hypochlorite transfer pumps, citric acid transfer pumps, sodium bisulfite neutralization dosing pumps, sodium hydroxide neutralization dosing pumps. All interconnecting wiring and piping between these dosing skids to the containers is not by H2O Innovation.

| Electrical System | Quantity of Equipment | By $H_2O$ | By Others |
|---|---|---|---|
| Container Control Panel complete with CompactLogix PLC Series with one 19'' Panelview plus 7 HMI (Note 1) | 2 | ✓ | |
| Power panels and Standalone VFDs | Lot | ✓ | |

| | | |
|---|---|---|
| Power connections and control wiring to $H_2O$ Innovation supplied panels Containers and dosing systems | Lot | ✓ |

Notes:

1. SCADA Software and Compatibility with GE/Emerson PLC: By flashing the CompactLogix processor with the latest version of Studio 5000, compatibility is assured. To clarify, a total of two control panels are supplied, one for each container, and each control panel is housed with a single PLC processor.



| Spare Parts | Quantity | By $H_2O$ | By Others |
|---|---|---|---|
| Diaphragm pumps (chemical dosing) | | | |
| Shelf spare (serviceable for Sodium Bisulfite & NaOH) | 1 | ✓ | |
| Air operated chemical transfer pump | | | |
| Shelf spare (serviceable for Citric acid & NaOCl) | 1 | ✓ | |
| CIP Pumps (Vertical centrifugal) | | | |
| Two (2) Spare mechanical seals of each type | LOT | ✓ | |
| One (1) Shelf Spare CIP pump | 1 | ✓ | |
| Backpulse Pumps (Vertical centrifugal) | | | |
| One (1) Spare mechanical seals of each type | LOT | ✓ | |
| UF Feed Pumps (Horizontal end suction) | | | |
| One (1) Shelf Spare UF Feed pump | 1 | ✓ | |
| Compressed Air system | | | |
| Two (2) sets of replacement compressor intake filters for each compressor | LOT | ✓ | |
| One (1) pressure regulator for each type supplied | LOT | ✓ | |
| One (1) pressure relief valve for each type supplied | LOT | ✓ | |
| One (1) automatic drain valve for each type supplied | LOT | ✓ | |
| Process Air Filters – two (2) replaceable filter element for each filter supplied | LOT | ✓ | |
| Programmable Logic Control Equipment | | | |
| Provide One (1) spare card PLC or Fieldbus module of each type including:<br>- CPU Modules<br>- Network / Communication Modules<br>- Discrete Input / Output Cards<br>- Analog Input / Output Cards<br>- Foundation Fieldbus Interface | LOT | ✓ | |
| Process Instrumentation Meters and Transmitters | | | |

| | | |
|---|---|---|
| Provide (1) spare for each type or range<br>- Level Transmitters<br>- Low-Flow Flowmeter with Controller<br>- Flowmeters Provide one spare for each size used<br>- Temperature Sensors | LOT | ✓ |
| Provide two (2) spares for each type or range<br>- Pressure Gauges<br>- Rotameter<br>- Pressure Transmitters Temperature Sensors | LOT | ✓ |
| Process Instrumentation Analyzers: | | |
| One (1) Turbidity Meter Calibration kit | 1 | ✓ |
| Two (2) ph Analyzer spare probes | LOT | ✓ |
| Two (2) ORP Analyzer spare probes | LOT | ✓ |
| Two (2) Conductivity Analyzer spare probes | LOT | ✓ |
| Control Panels, Enclosures, and Panel Instruments | | |
| Six (6) spare bulbs for each type of bulb used in the control system. | LOT | ✓ |
| Six (6) spare fuses for each type and size of fuse used in the control system | LOT | ✓ |
| Three (3) spare control relays of each type used in the control system | LOT | ✓ |
| One (1) spare type of each signal conditioner (isolator, adder-subtractor, etc.) of each type used in the control system. | LOT | ✓ |
| Ball Valves, Butterfly Valves, Section, Check Valves, Specialty Valves and Valve Actuators | | |
| One (1) spare valve for each 3 valves of any type or kind are provided (Note 1)<br>One (1) spare actuiator for each 3 actuators of any type or kind are provided<br>Two (2) seal kits for each type/size of modulating actuator | Lot | ✓ |

Notes:

1) Since H2OI selected butterfly valves (Bray series 3L) utilize a molded-in seat, seats cannot be replaced. Instead of providing one (1) spare valve and two (2) seats, two (2) spare valves are provided for butterfly valves.

## 4.2 ENGINEERING AND PROJECT EXECUTION SCOPE TABLE

In addition to the equipment provided above, we are also providing the following:

| General | Quantity of Equipment | By $H_2O$ | By Others |
|---|---|---|---|
| System P&IDs for equipment supplied by $H_2O$ Innovation | - | ✓ | |
| General Arrangement Drawings for Containerized Systems supplied by $H_2O$ Innovation | - | ✓ | |
| System Layout (Within Containers) | - | ✓ | |
| System Layout (Outside Containers) | - | | ✓ |
| Plant Control Narrative for equipment supplied by $H_2O$ Innovation | - | ✓ | |
| PLC programming for equipment supplied by H2O Innovation | - | ✓ | |
| Operation & Maintenance Manual for equipment supplied by H2O Innovation | - | ✓ | |
| Engineering Submittals and Shop Drawings | - | ✓ | |
| Seismic calculations stamped by a PE registered in Oregon | - | ✓ | |
| Factory Acceptance Test at H2O Innovation's manufacturing plant | - | ✓ | |
| Equipment Delivery to Site | - | ✓ | |
| Unloading of Equipment at Site | - | | ✓ |
| High-Speed Internet Connection at Site | - | | ✓ |
| Spare Parts as outlined herein | - | ✓ | |
| Startup/Commissioning, and site service | - | ✓ | |
| One (1) Year Membrane System Warranty for equipment supplied by $H_2O$ Innovation | - | ✓ | |
| 10 (ten) Year Prorated UF Membrane Element Warranty (5 Year Full Replacement, 5 Year Pro-Rated) | - | ✓ | |

Please note that for Mechanical submittals (Equipment, Instruments, and Valves) and Electrical submittals (single line diagram, network diagram, electrical schematics, and panel drawings) for

the equipment supplied by H2O Innovation will both be consolidated into two separate electronic files with hyperlinks to the generic manufacturer datasheet and Operations & Maintenance manuals.
Examples of H2O Innovation's Single Line Diagrams and Electrical Drawings are provided in **Appendix O** which demonstrates H2O Innovation's standards and level of details.

Our offer is based on providing H2O Innovation's standard tagging convention. Custom tagging can be provided as a price adder upon request.

## 4.3 BUYER/OWNER RESPONSIBILITY

Unless otherwise stated, the buyer and/or owner are responsible for the following:

- Installation of skidded and loose-shipped equipment not pre-assembled within containers.
- Preparation and installation of membrane modules.
- Any site protection and shading, namely, to protect equipment not included with the containers.
- Supply and installation of interconnecting piping and wiring between containers, skidded and loose shipped equipment.
- Supply and install adequately sized drain lines leaving each container to facilitate a free gravity drain with zero backpressure on the line. This is required as it is important to drain the UF racks at the end of each backwash sequence and this drain step occurs rapidly to ensure minimal offline time.
- Pretreatment systems upstream of the UF system
- Post-treatment systems downstream of the UF system
- Storage tanks for UF chemical systems
- Static mixers to facilitate chemical feed mixing outside containers.
- Supply and installation of anchor bolts outside containers
- Supply and integration of the plant SCADA
- Unloading, unpacking, storage, installation of H2OI supplied containers and installation of all dosing skids
- Flushing of all piping and tanks and verification of the removal of all residual debris from construction activities prior to startup of the UF systems.
- Site work, including site civil, concrete, shading and heating/insulation of equipment to be installed outside containers.
- Supply of chemicals
- Any and all site work, yard piping or electrical installation outside the containers.
- Any and all Permits for the site.
- Any and all lab and hand-held water quality test equipment or calibration equipment.
- Disposal or handling of any and all waste produced, including membrane preservative solution.

## 4.4 EQUIPMENT MANUFACTURERS

The following table shows the list of equipment and instrumentation suppliers preliminarily selected for this project, subject to "or equal" substitution during the detailed engineering phase of the project.

| Equipment Description | Manufacturer |
|---|---|
| Horizontal End Suction Centrifugal Pump | Grundfos |
| Vertical Multi-stage Centrifugal Pump | Grundfos |
| Compressor | Ingersoll Rand – Scroll Type Oil-free |
| UF Immersion Heaters | ASB |
| UF Membranes | Toray HFUG-2020AN |
| Pressure Gauges | Wika Type 233.54 |
| Pressure Transmitters and Hydrostatic Level Transmitters | Endress & Hauser PMP11 series |
| Temperature Transmitters | Endress & Hauser TH13 + TMT142 |
| Turbidity Meters | HACH TU5300 Series |
| ORP probe | Endress & Hauser |
| pH probe | Endress & Hauser Orbipac CPF81 Series |
| pH Transmitter | Endress & Hauser, Liquisys M CPM223 Series |
| ORP/pH transmitter | Endress & Hauser Memosens CPS31E |
| Magnetic Flowmeters | Endress & Hauser Promag W400 Series |
| Air Flowmeter | Omega FLMG |
| Butterfly Valves | Bray, 3L series |
| Swing Check Valves | Praher SCV |
| PVC ball valve | Asahi |
| SST ball valves | Apollo 86R-100/86-500 Series |
| Valve pneumatic actuator | Bray S92 series |
| Couplings | Piedmont |
| PLC | Allen Bradley CompactLogix |
| Remote IO | Wago |

## 4.5 WARRANTIES

### 4.5.1 UF SYSTEM PERFORMANCE WARRANTY

As outlined in Section 01 74 00 – *Membrane System and Module Warranty* clause 1.05 *Membrane system Warranty.* The warranty period extends 365 days following the Notice of Substantial Completion. H2O Innovation warrants that the membrane equipment and ancillary systems when operated within conditions specified in the Contract Documents will meet the Performance Criteria as specified in Section 11 30 00 – Containerized Hollow fiber Membrane Equipment.

### 4.5.2 UF MEMBRANE WARRANTY

H2O Innovation will offer a UF membrane warranty for a period of 10 years. For the first 5-years, commencing six months from equipment delivery to site or from the point where water first touches membrane modules, whichever comes first, H2O Innovation guarantees that the membrane elements will be free from defects in materials and workmanship, followed by the next 5 years being warranted on a prorated basis.

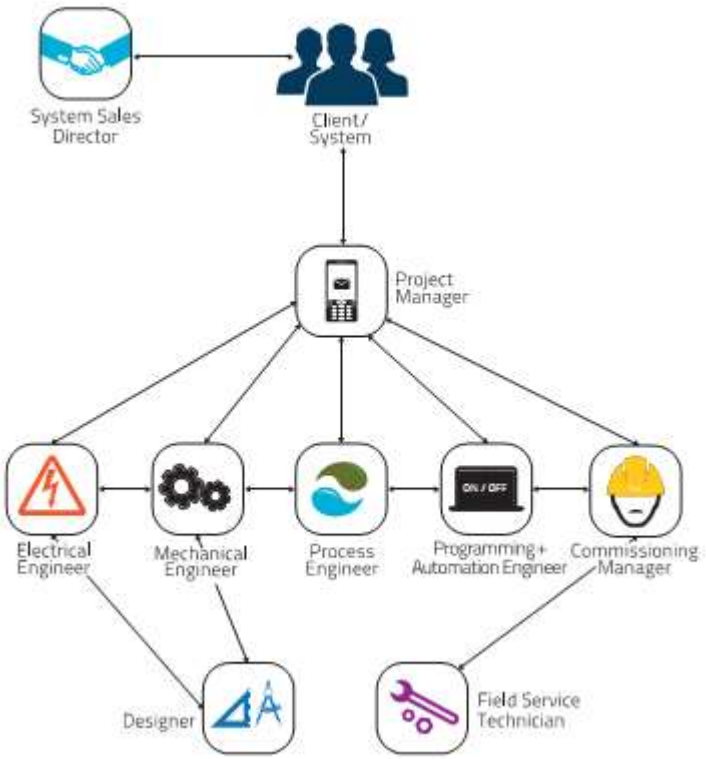
# SECTION 5 – PROJECT EXECUTION

## 5.1 KEY PERSONNEL

Our project manager will be the main point of contact for all communication between you, your engineering team and $H_2O$ Innovation's engineering team. $H_2O$ Innovation's project manager selected for this project, Mike Humphreys, has extensive experience in water and wastewater treatment. Mike has been project manager on many FlexBox systems in the past few years. He also managed many large capacity systems as shown on his resume in Appendix P.

Mike has been in the membrane treatment industry and held multiple positions at Hydranautics, Membrane Systems then H2O Innovation for over 40 years.

Our Project Manager's mission will be to regularly interact with your team outside of planned events and meetings to ensure a completely open, efficient and effective communication line.




Your project manager will be supported by the Mechanical, Drafting, Process and Electrical/Controls departments. Someone will be assigned to your project within each of these teams and will remain so until the end of the project. We will use our project manager to facilitate direct discussions between the different disciplines on your side and on ours to promote collaboration. The Key Personnel from H2O Innovation are the following:

**Project Manager** – Mike Humphreys (Chris Whiting as alternate – Director of Project Management)

**Mechanical Engineering Manager** – Nicolas Cormier (also, Blair Kariniemi as Senior Mechanical Engineer)

**Process Engineering Manager** – Bill Legge (also, Sébastien Barbeau as senior UF Process Engineer)

**Senior Engineering Advisor** – Paul Laverty

**Programming + Automation Engineer** – Dustin Zachman

**Electrical Design Manager** – Etienne Roy

**Designer** – Greg Bauer

**Commissioning/Field Service Technician** – Sébastien Tremblay/Bill Youels

**System Sales** – Shayan Yaghoubi

**Resident Representative** – Aditya Kumar

During equipment installation, our project manager will be front and center to ensure a smooth and seamless equipment installation process. Our project manager will coordinate and manage site activities for all work performed by H2O Innovation's site forces.

For further information on $H_2O$ Innovation's staff shown above and their expertise in ultrafiltration and reverse osmosis, please see **Appendix P** for their individual resumes. Their resumes include their applicable licenses, years worked for the company, and if applicable, years worked in the field.

## 5.2 FLEXIBILITY OF TEAM APPROACH

Our teams are focused, flexible and interconnected. If we need to adjust workload, we can pull from our different teams to accommodate incoming or outgoing projects. A lot of our engineers are trained on several disciplines throughout their years with previous employers and within their time at $H_2O$ Innovation, and we can pull from their earlier experiences for the benefit of your project.

We have a team of 83 people dedicated to project engineering, manufacturing, commissioning and service. This is enough resources for us to pull from and adjust our workload to match your needs. We have also established relationships with key contractors over the years to help us manage peak activity, if required.

## 5.3 PROJECT APPROACH

Our manufacturing plant in Minnesota employs fully qualified AWS welders for carbon steel. Stainless steel fabrication and electrical panels are assembled meeting the UL requirements by

certified electricians. All electrical panels bear the UL label. The following describes in brief the location and capabilities of our three manufacturing facilities:

1- Quebec - 62,000 ft²
**Facilities available:**
- Pipe and frame welding
- Skid assembly
- PLC Programming
- Factory acceptance testing
- Sand blasting and painting
- Electrical panel assembly (UL cert.)

2- Minnesota - 31,000 ft²
**Facilities available:**
- Piping and frame welding
- Skid assembly
- PLC Programming
- Factory acceptance testing

3- Vista – 12,000 ft²
**Facilities available:**
- Piedmont couplings
- PWT Chemical Production
- Membrane autopsy/testing

Skid mounted systems fabrication, welding, manufacturing and assembly, piping spools and panel assembly is accomplished in our manufacturing plants in Minneapolis, MN and Ham-Nord, QC.

$H_2O$ Innovation has demonstrated experience in various water treatment processes including:

- ✓ Conventional Filtration - Multimedia, Carbon, Cartridge
- ✓ Secondary Clarification
- ✓ IFAS Technology – Bio-Wheel™
- ✓ Membrane Bioreactor and Conventional Wastewater Plants
- ✓ Softening - Membrane and Ion Exchange
- ✓ Low pressure membranes – MBR / MF / UF
- ✓ High pressure membranes - Reverse Osmosis, Nanofiltration

- ✓ Electrodeionization
- ✓ Degasifiers - Forced Draft and Vacuum
- ✓ Demineralization - Cation, Anion, and Mixed Bed
- ✓ Chemical Feed Systems

All raw materials and components are procured from reputable and qualified suppliers with emphasis on quality and workmanship. Over the years we have maintained excellent relationships with our vendors.

We only have one focus, one business: WATER. This ensures that you will deal with a player that is entirely focused on your solution and not potentially distracted by other corporate priorities.

**Manufacturing capacity (2024-2025):**

(As the systems are containerized, a significant portion of the work can be accomplished outside.)

Québec:

Indoor available area to build assemblies (current/projected): 65 / 55%

Outdoor available to build 2 containers (current/projected): 100%

Manpower availability (current/projected): 65 / 55%

Minneapolis:

Indoor available area to build assemblies (current/projected): 70 / 65%

Outdoor available to build 2 containers (current/projected): 100%

Manpower availability (current/projected): 70 / 65%

With the expected shop capacity in the next 6 to 18 months, we do not foresee any schedule delays for fabricating the equipment for this project and delivering the equipment by the required delivery date per the RFP documents.

## 5.4 PROJECT SCHEDULE

H2O Innovation offers the following schedule for management of the proposed Containerized UF treatment systems:

**Pilot study:**

- Provide Final Pilot Study Work Plan
  - 1 week after comments from Engineer and receipt of equipment supply purchase order.
- Pilot unit delivery
  - Ready to ship 2 weeks after Final Pilot Study Work Plan acceptance by the client
- Pilot plant Operational at site
  - 1 week after reaching site (2 weeks after leaving H2OI manufacturing plant)
- Phase 1 of pilot study finalization
  - 30 days after being operational
- Phase 2 of pilot study finalization
  - 30 days after phase 1 finalization
- Phase 3 of pilot study finalization
  - 30 days after phase 2 finalization
- Pilot unit decommissioning and leaving site (shipped to H2OI manufacturing plant)
  - 1 week after phase 3 finalization
- Submit Draft piloting summary report
  - 2 weeks after phase 3 finalization
- Submit Final piloting summary report
  - 1 week after Engineer comments

**Engineering:**

- Preparation and submission of approval documents:
  - First Shop Drawing Submittal packages will be provided for review in accordance with the specified schedule of 45 calendar days after Effective Date of Agreement in order to receive approval within 90 calendar days after Effective Date of Agreement.
  - Second Shop Drawing Submittal packages will be provided for review in accordance with the specified schedule of 90 calendar days after Effective Date of Agreement in order to receive approval within 135 calendar days after Effective Date of Agreement.

**Fabrication and Delivery of Goods:**

- Beginning of fabrication:
  - Immediately following notice to commence fabrication.
- Testing and inspection, including hold points and approval periods:
  - To be confirmed during detailed engineering.
- Production holidays, scheduled downtime, and/or plant closures:
  - To be confirmed during detailed engineering.
- Packing/crating, permitting, and routing for shipment:
  - To be confirmed during detailed engineering.
- Complete delivery of treatment containers and ancillary equipment including transportation time:
  - 340 days after Notice to Commence Fabrication

**Special services:**

- Supply electronic version of Installation Manuals (paper version to be shipped within 5 working days of electronic version supply)
  - 150 calendar days after Notice to Commence Fabrication.
- Commissioning of supplied equipment
  - 30 calendar days after Notice of Completed Installation
- Operator Training
  - 15 calendar days after Notice of Completed Commissioning
- Supply electronic version of Preliminary O&M Manual
  - 15 calendar days after Notice of Completed Installation
- Acceptance Testing
  - 45 calendar days after Notice of Completed Operator Training
- Supply electronic version of Final O&M Manual (paper version to be shipped within 5 working days of electronic version supply)
  - 45 calendar days after Notice of Substantial Completion
- Warranty Period
  - 365 calendar days after Notice of Substantial Completion

## 5.5 INSTALLATION SERVICES

As detailed in section 5.4 above.

Also, since the bulk of the supply are containerized units, minor site work will be required to connect everything. The commissioning specialist on site will be supported from the project engineer and manager remotely to help guide the general contractor.

As specified, five (5) 4-day trips on-site are included specifically for that purpose.

## 5.6 TRAINING

As outlined in section 01 73 10 – *Training of Operations and Maintenance Personnel.*

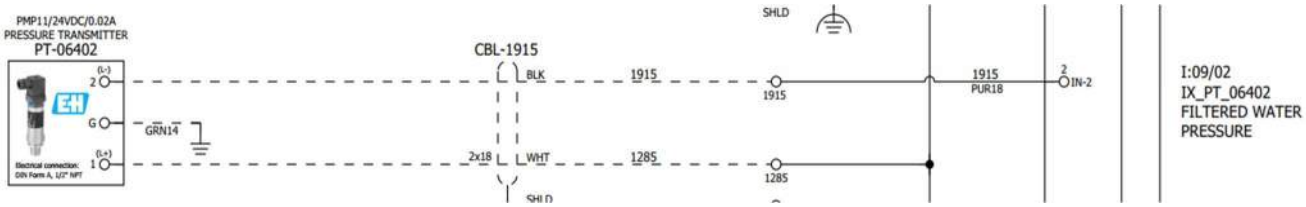
| Level of Training | Number of Shifts | Maximum Number of Participants | Classroom Training (Hours) | Hands-On Training (Hours) |
|---|---|---|---|---|
| Membrane System | 1 | 8 | 8 | 16 |
| Mechanical Equipment | 1 | 8 | 8 | 16 |
| Instrumentation and Control Equipment | 1 | 4 | 8 | 16 |
| PLC / HMI | 1 | 4 | 16 | 16 |

Also, $H_2O$ Innovation has developed extensive training modules for our UF membrane filtration systems. We have executed training programs successfully for many other similar treatment facilities and, throughout time, the $H_2O$ Innovation training modules have improved using the feedback from customers.

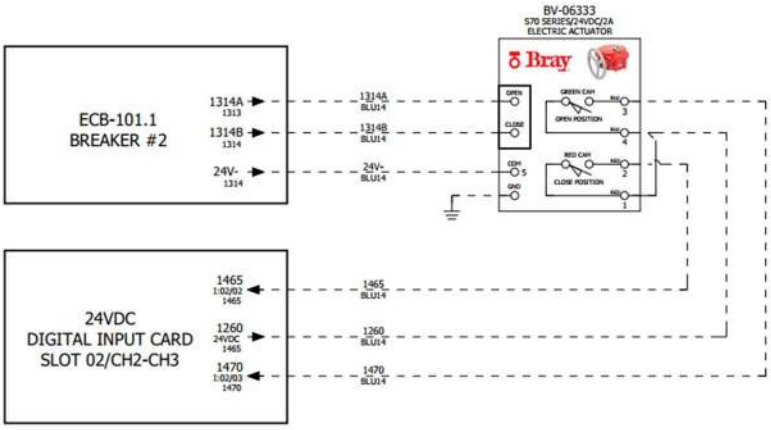
## 5.7 ENGINEERING CAPABILITIES

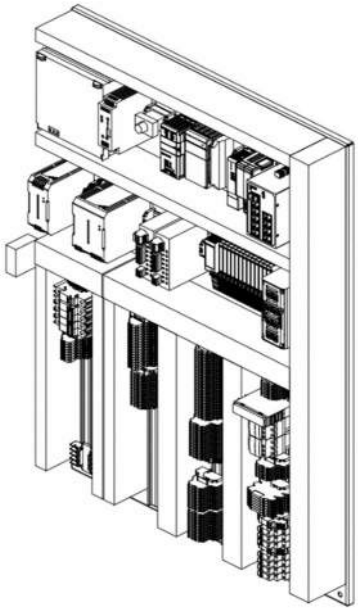
A picture is worth a thousand words. H2O Innovation is able to provide superior submittals with clear depiction of the equipment and hyperlinks right within the lists. Electrical drawings provide clear visuals of each piece of equipment as well. Each wire is obviously numbered, but each terminal within the instrument is also referenced.

| | | | | | |
|---|---|---|---|---|---|
| ENDRESS & HAUSER | COS81D-AAA2CB31 | DIGITAL DISSOLVED OXYGEN PROBE, 0.004-26 MG/L RANGE, C-SHAPED PROBE, FKM ORING, 316L SHAFT, PG13.5, 120MM LONG, MEMOSENS, NO CABLE | | DETAILS O&M CUTSHEET |
| ENDRESS & HAUSER | 5W3B80-CDEDBAAAFADUA1KGAA1 | 3 INCH PROMAG W300 MAGMETER, FIXED CLASS 150 FLANGE, 24VDC, 4-20mA W/HART, POLYURETHANE LINER, 316SS ELECTRODES, 0.5% ACCURACY, CLASS 1 DIV 1 | | DETAILS O&M CUTSHEET |
| ENDRESS & HAUSER | 10D40-3LGA1RA0B5AA | 1.5 INCH PROMAG 10D MAGMETER, CLASS 150 B16.5 WAFER, 24VDC, 4-20mA W/HART, POLYAMIDE LINER, CLASS 1 DIV 2 | | DETAILS O&M CUTSHEET |
| ENDRESS & HAUSER | PMP11-CA1V1HFVXJ | PMP11 PRESSURE TRANSMITTER, CSA C/US GEN PURPOSE, 4-20MA, 1/2 NPT ELECTRICAL CONNECTION, 0 TO 15 PSIG, PSI SENSOR RANGE, 1/2 MNPT X 1/4 FNPT PROCESS CONNECTION. | | DETAILS O&M CUTSHEET |
| ENDRESS & HAUSER | CM442-CAM2A4F061A | CM442 DIGITAL TRANSMITTER, 2 DIGITAL INPUTS, 4 4-20mA OUTPUTS, 24VDC, CSA GENERAL PURPOSE | | DETAILS O&M CUTSHEET |




Panels are designed in 3D with actuators and/or limit switches also clearly identified.

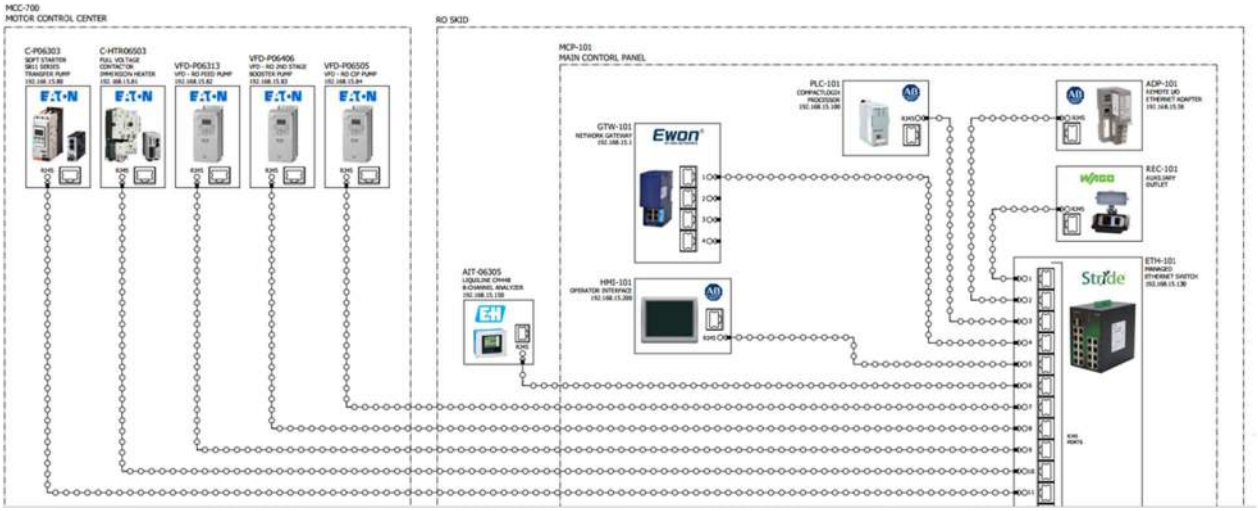


| MANUFACTURER | DESCRIPTION | |
|---|---|---|
| SCHNEIDER ELECTRIC | SAFETY EMERGENCY STOP RELAY, 24VDC | DATASHEET |
| SCHNEIDER ELECTRIC | PLASTIC PUSH BUTTON 22mm, 6 COLOURED CAPS | DATASHEET |
| SCHNEIDER ELECTRIC | NON-ILLUMINATED E-STOP PUSH BUTTON | DATASHEET |
| SCHNEIDER ELECTRIC | ILLUMINATED E-STOP PUSH BUTTON | DATASHEET |
| SCHNEIDER ELECTRIC | OPERATOR MOUNTING LATCH | DATASHEET |
| SCHNEIDER ELECTRIC | SINGLE N.O. CONTACT BLOCK | |
| SCHNEIDER ELECTRIC | SINGLE N.C. CONTACT BLOCK | DATASHEET |
| SCHNEIDER ELECTRIC | WHITE LED MODULE, 24V AC/DC | DATASHEET |

https://h2oinnovationqc.sharepoint.com/:b:/s/H2O_Cloud/EcsuplcFXbZCulk-LKFzss4Bx7e81APE_mZ_4_5zJUJo5A?e=9tDgzx

Network diagrams don’t have to look like a maze:




In addition, H2O Innovation has adopted the use of smart P&IDs. This allows the reviewer and end-user to simply click on any piece of equipment, valve, instrument or device and it immediately takes you to a description and properties of that item including manufacture's details, technical data sheet, quantity and O&M information.

| =DRAWINGS+C01-B-2331 | |
|---|---|
| Properties | |
| Part properties | |
| Parts: GM15LDN100 (20U5216) | |
| MANUFACTURER | AERZEN |
| ITEM DESCRIPTION | POSITIVE DISPLACEMENT BLOWER, 4 INCH FLEXIBLE COUPLING OUTLET, 25HP, 1800RPM MOTOR, 480VAC/3PH/60HZ |
| QUANTITY | 1 |
| CUTSHEET | https://h2oinnovationqc.sharepoint.com/:b:/s/H2O_Cloud/EYUwDlXxYI1AlksQriqQjaUBJ3n8O6k9AZyIK5_vh5npxA?e=x3ZH4a |
| O&M | https://h2oinnovationqc.sharepoint.com/:b:/s/H2O_Cloud/EfnJTq8qhitNjzDpraAMQwUB26p4-btd0NPiRAte7c4yig?e=daC1pr |
| DETAILS | https://h2oinnovationqc.sharepoint.com/:b:/s/H2O_Cloud/EX0wEZwkfapKumnzZH9CtukBc7QTJ_y0hUlcTPJLb6iC7w?e=S6Vwkr |

## 5.8 COMMISSIONING

As outlined in section 01 66 00 – *Commissioning of Membrane Equipment*.

$H_2O$ Innovation's commissioning and service team is comprised of 8 persons, who have a combined experience of over 60 years of field service in controls, mechanical troubleshooting, and remote programming. Resumes of the personnel that will be involved in your project are provided in **Appendix P**.

In order to provide for an efficient commissioning period, the customer shall provide a high speed internet connection at the site to allow $H_2O$ Innovation staff to troubleshoot the PLC code, adjust set points, and remotely add functionality during the plant start-up. We have assumed that the cost of the water sampling and analysis will be outside of $H_2O$ Innovation's scope during our time on site for the plant start-up, commissioning, and performance testing.

## 5.9 ONE-YEAR ONSITE SERVICES

As outlined in section 01 68 00 – Operation Assistance.

Our network of existing plants ensures that H2O Innovation continues to have a strong presence with a solid workforce of technicians and service professionals throughout the US. $H_2O$ Innovation has carefully reviewed the specified on-site installation assistance, system start-up, performance testing, and operator training service requirements against the system proposed to provide adequate time to commission the project and provide adequate training as per the specifications:

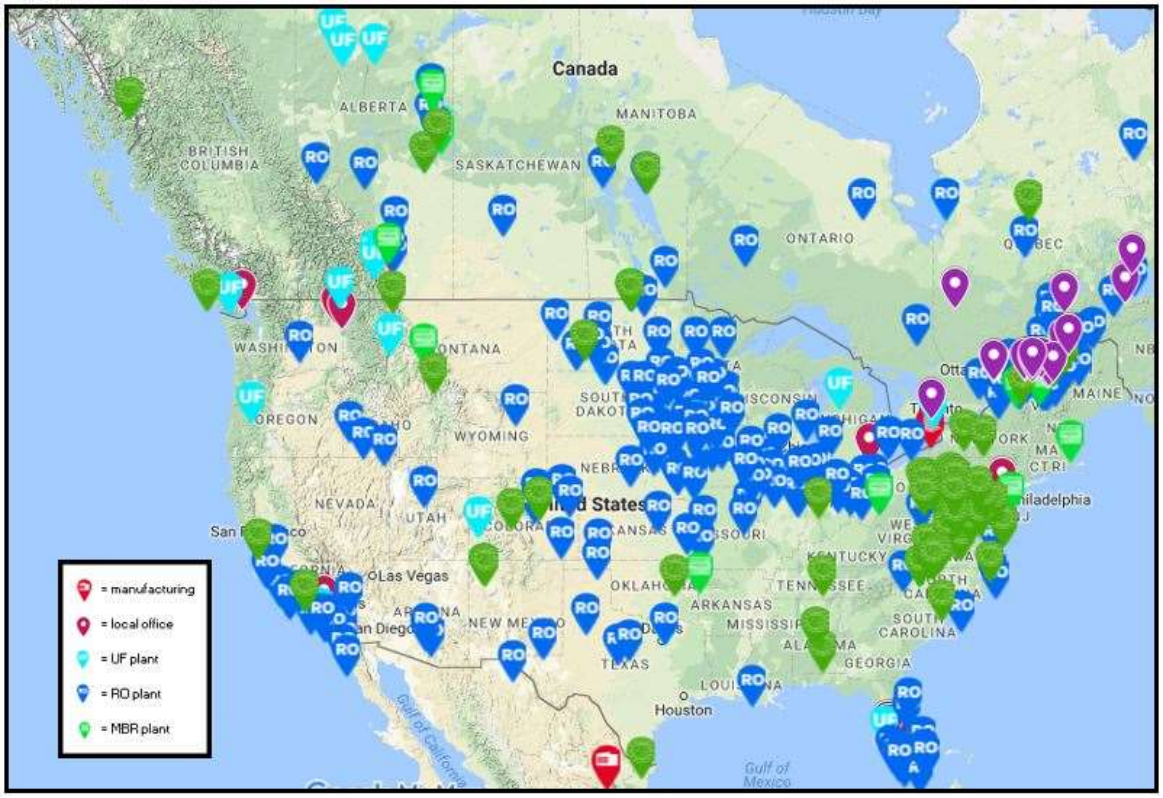
- On-site field service for installation assistance
- Commissioning activities including functional, performance and monitoring tests.
- Post commissioning/start-up phase of the project
- On-site field service for support during the SAT
- On-site field service for classroom training of the City's operators.
- On-site field service during the warranty period.

Our service team can be reached via phones for emergencies. In these cases, a person is on call to receive your requests. If this person cannot be reached immediately, we will strive to return your call and assist you in the shortest delay possible. Our service representative will then either be able to assist you or find the resources to solve your problem. For regular, non-emergency, support requests, such as planned part replacements or planned service visits, our team can also be reached by e-mail at service@h2oinnovation.com


Service support for the Alder Creek - City of Sandy WTP project will be provided through our Vista California office and Champlin Minneapolis office to ensure fast field response dispatch time.

- **Service capabilities:** H2O Innovation through our service centers in Vista and Champlin, and in partnership with the operations division of our company (Utility Partners), will provide onsite service and maintenance for all equipment systems and related components. H2O Innovation has used this extensive team of service professionals successfully on past UF systems across North America. Our intimate knowledge and familiarity of UF technologies guarantees fast, dependable and reliable service for the expansion project as well as future plant service and maintenance tasks.

In addition to our commissioning and service teams and service hotline, $H_2O$ innovation has an extensive network of existing customers in United States and Canada. To illustrate our breadth of coverage, our presence in North America is highlighted in the following map.




## 5.10 INTELOGX™

$H_2O$ Innovation has developed a remote monitoring system called the Intelogx™, which combines early detection of any issues that may arise, system optimization, remote troubleshooting and accessibility of systems, and common data storage all into one, simple platform.

There are three tiers of Intelogx™ that can be chosen: INTELOGX™ CONNECT, INTELOGX™ STANDARD, and INTELOGX™ PLUS +.

All three tiers of Intelogx™ are equipped with remote operations. With remote operation, you have online and remote access to HMI controls in real time. This allows you to have the ability to start, stop, and adjust operating setpoints, as well as respond to alarms from virtually anywhere.

With INTELOGX™ CONNECT, data acquisition and the general status of the health can be accessed.

DATA ACQUISITION – with data acquisition, you have the ability to log all your high-value tags, store data safely on $H_2O$'s servers, archive all alarms, and check the status of every analog signal available.

With INTELOGX™ STANDARD, all of what is offered with Intelogx™ Connect is provided along with data trending.

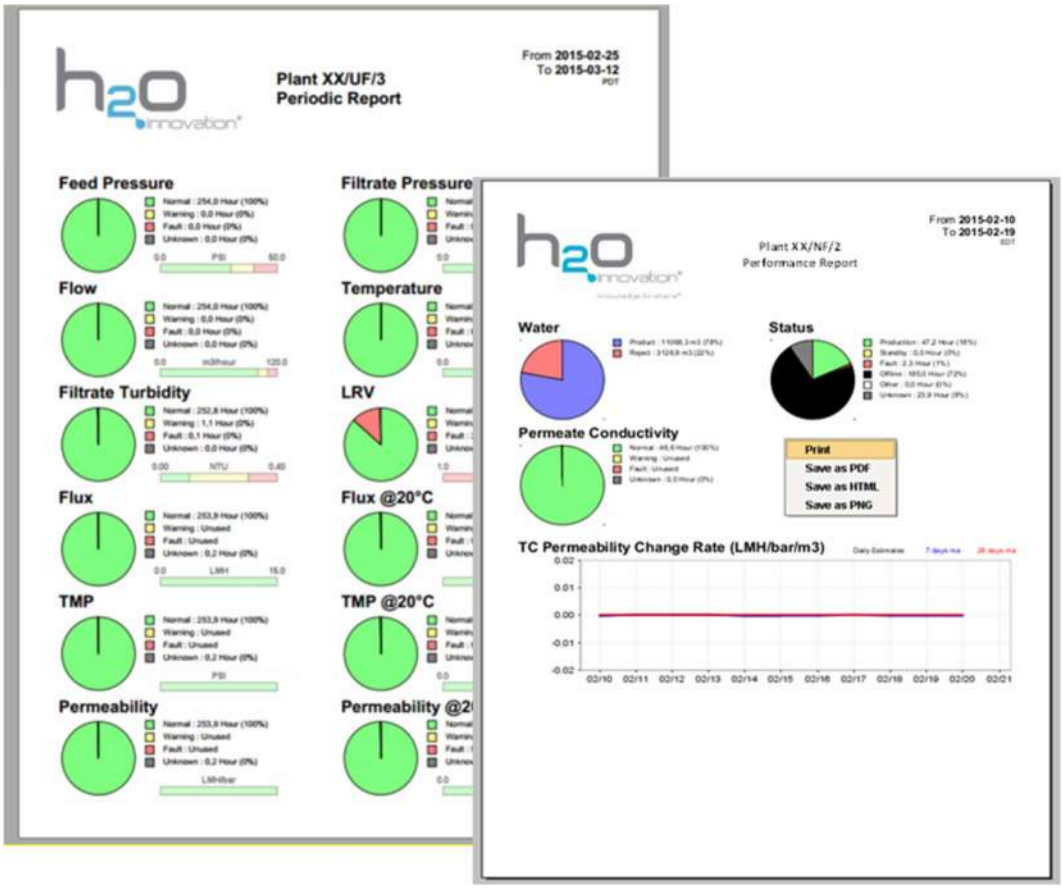
DATA TRENDING – with data trending, you can see the overall unit operation and health with graphs of the system's historical trends. In addition, plant alarm notifications can be sent via email and text message, different types of alarms can be sent to different people, and all trending and reports are available via web access.

With INTELOGX™ PLUS +, what is offered for the Intelogx™ Connect and Intelogx™ Standard is provided, along with performance analysis and suggestions for optimization.

PERFORMANCE ANALYSIS AND OPTIMIZATION - with performance analysis, monthly, and annual system performance reports can be generated, with review and analysis of the trends performed by one of our process engineers. If optimization of the system is required, our specialized technicians can provide on-site visits. Additionally, personalized and customized performance reports at set intervals can be provided.

An example of the performance reports is shown below and on the following page.

In addition to monitoring the performance of treatment equipment, our IntelogX™ system can easily be adapted to include the monitoring of plant equipment that is provided by others. We would be pleased to discuss this option further with the City, if there is interest in incorporating this into our offer.




For more information on Intelogx™, please see our website at www.h2oinnovation.com.

## 5.11 CHEMICAL SERVICES

In addition to offering your complete water treatment package, $H_2O$ Innovation is the only place where chemicals and membranes are under one roof. There are membrane people that are membrane experts, and chemical people that are chemical experts; we have leveraged the two together.

Now, why is this important? The savings. You save in:

- Chemicals
- Money
- Optimization
- Operating costs

As important as equipment design, construction, and installation are to our clients, we know that efficient on-going operation is equally critical for you. At $H_2O$ Innovation, we take pride in supporting our clients for the long term. As partners, you will be uniquely positioned to take advantage of our Specialty Chemicals and Services. Our team is highly experienced in

maintaining systems at their maximum efficiency for optimized life-cycle costs and operational reliability. To strengthen your operational performance and maintain the value of your capital assets, our team can provide the following products and services:

- SpectraGuard™ antiscalants for reduced scaling and fouling potential for every type of feed water.
- FilteRx™ filter aids to enhance the filtration capabilities of mixed media filter systems.
- Lavasol™ liquid membrane cleaners to remove foulants from MF/UF and NF/RO membranes.
- OptiClean™ powder membrane cleaners to remove foulants from MF/UF and NF/RO membranes.
- A wide range of filters, membranes and spare parts keep your system at its maximum efficiency point.
- Membrane Forensics™ detailed laboratory analyses and investigations to troubleshoot potential membrane fouling and failure.
- On-site services, system profile, cleaning audit and complete water analysis.
- ProDose™ software is used by our technical support team to determine the best antiscalant for your specific system and operating parameters and will predict the most likely precipitants.

To get more information on our service offering please visit www.pwtchemicals.com or www.h2oinnovation.com

# SECTION 6 – CORPORATE HISTORY AND EXPERIENCE

$H_2O$ Innovation is a complete water treatment solutions company, providing custom-designed water treatment systems along with operating and maintenance solutions.

$H_2O$ Innovation designs, develops, produces and integrates custom-built water treatment systems for multiple markets in the United States, Canada and abroad. Whether it is for the **production of drinking water**, the **treatment of wastewater**, or for use in **industrial processes**, our solutions combine the best expertise with the most advanced membrane technology products.

Our reliable, eco-friendly solutions streamline costs and optimize treatment. As renowned membrane filtration specialists, we provide counsel and solutions that result in efficient and reliable systems that perform and last, whatever the need and application.

## 6.1 H2O INNOVATION - GENERAL COMPANY INFORMATION

Our worldwide presence, which includes our Water and Wastewater Projects, Maple Farming Equipment, Chemicals and Desalination Equipment business lines, is shown below in the World map:


$H_2O$ Innovation Inc. was co-founded by our Company's CEO & President over 24 years ago (14 years ago for H2O Innovation USA, Inc). Since then, our company has steadily grown to 1,070 employees (856 employees for H2O Innovation USA, Inc. and 214 for H2O Innovation Inc.) with a combined annual revenue of $250 million. $H_2O$ Innovation has installed over 750 systems worldwide and is exporting specialty products in more than 40 countries. What started as a single

operation in one location has now grown into a strong North American presence. $H_2O$ Innovation has set its goal on becoming an active and important player in the consolidation of the water treatment industry. Over its decade and a half of existence, the company has drawn up a sound development strategy, which includes internal growth, external growth and strategic alliances. The company's activities rely on three pillars which are i) water & wastewater projects, and services; ii) specialty products, including a complete line of specialty chemicals, consumables and specialized products for the water treatment industry; and iii) operation and maintenance services for water and wastewater treatment systems.

## WATER & WASTEWATER PROJECTS, AND SERVICES

$H_2O$ Innovation designs and provides custom-built and integrated water treatment solutions based on membrane filtration technology for municipal, industrial, energy and natural resources end-users, aftersales services as well as digital solutions (Intelogx™) to monitor and optimize water treatment plants.

## SPECIALTY PRODUCTS

$H_2O$ Innovation also offers a complete line of maple equipment and products, specialty chemicals (under the PWT brand), consumables and specialized equipment for desalination (under the Piedmont brand).

## OPERATION AND MAINTENANCE SERVICES

Lastly, H2O Innovation operates, maintains, and repairs water and wastewater treatment systems, distribution equipment and associated assets for its O&M clients and ensures that water quality meets regulatory requirements, through Utility Partners & Hays Utility South Corporation.

All our process engineering and design, project management, procurement, manufacturing and assembly, testing and after-sales service are performed from the locations shown in the map below:


## 6.2 BUSINESS PHILOSOPHY

$H_2O$ Innovation's mission is to develop, produce and bring to market safe, integrated, and customized products for the production of drinking water and industrial process water, the reclamation of water and the treatment of wastewater. Our systems are environmentally friendly and aim to meet or exceed local and federal water treatment standards.

$H_2O$ Innovation's approach is to review and fully understand our customer's needs before making recommendations. We conduct a complete analysis of the customer's unique situation and consider all possible solutions, with an emphasis on technical suitability, capital and operating costs, energy savings, maintenance requirements and equipment amortization. Technical specifications are fully respected in the development of our proposal and during the execution of the project. In the absence of technical specifications, proposals are prepared jointly with the customer and customer's engineer, who become key partners in the design process. Our systems utilize standard replacement parts for valves, motors and switches that are available easily from well-known manufacturers. Technical submittals for approval are prepared in conformance with the requirements of the specifications and presented for ease in the evaluation by the engineer. Any deviation and/or exception to the specifications are clearly identified.

$H_2O$ Innovation has acquired a unique know-how in the sector of membrane filtration and applies it in the development of highly efficient solutions. The Corporation possesses a broad line of products serving various customers in the municipal, commercial, institutional, industrial, oil & gas, mining and energy markets. We are able to build complex and highly specified projects for a variety of applications, as exemplified in this video: http://vimeo.com/61737449.

## 6.3 GLOBAL MEMBRANE TECHNOLOGY RESOURCES - TORAY

For this important project, $H_2O$ Innovation is proposing to use the Toray HFUG-2020AN membrane module as its base system offer. The Toray module is constructed using a TIPS membrane fiber chemistry. The Toray module is a mature and stable membrane product used in municipal potable water treatment applications with over 10 years of installed experience.

Founded in 1926, Toray is a world leader with over 35 years of experience in the development and manufacturing of advanced membranes for the treatment of water and wastewater.

Today, Toray employs almost 40,000 people at over 200 facilities around the globe and generates annual revenues in excess of US$16 billion. Expanding from its core businesses of fibers, textiles, plastics and chemicals, Toray has become a major force in strategically expanding & developing businesses such as IT-related products, carbon fiber composite materials, environmental technologies and life sciences.

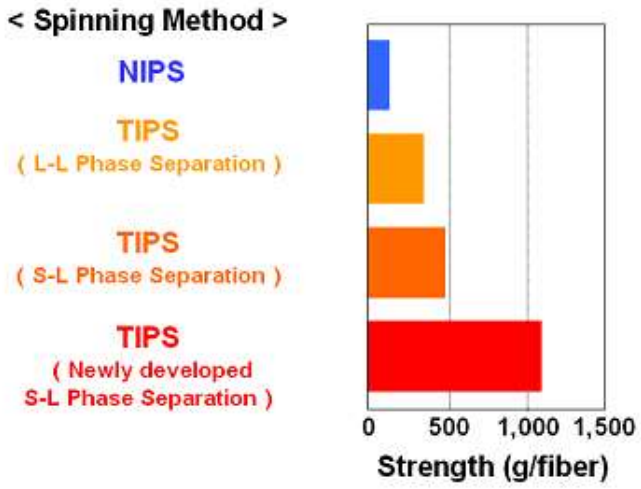
A pioneer in the application of membranes to the treatment of water, Toray began its reverse osmosis (RO) development program in 1968. Today, Toray offers the most extensive portfolio of water treatment membranes in the industry – RO, nanofiltration (NF), ultra-filtration (UF), micro-filtration (MF) and membrane bioreactor (MBR) membranes – combined with a globally-recognized expertise in the successful application of these technologies to some of the world's most challenging water treatment situations.

Toray's Corporate Guiding Principles focus on "placing top priority on safety, accident prevention and environmental preservation". Their vision is to make a global contribution toward conserving resources and protecting the environment to develop a sustainable recycling-oriented society. In recognition of its environmentally friendly business activities, including its involvement in such areas as seawater desalination, water treatment and carbon fiber composite materials businesses as well as for its CSR activities targeting climate change prevention and sustainable social growth, energy saving measures and betterment of the workplace, Toray was honored by receiving the 2008 Humanitarian Award from the United Nations Association of New York.

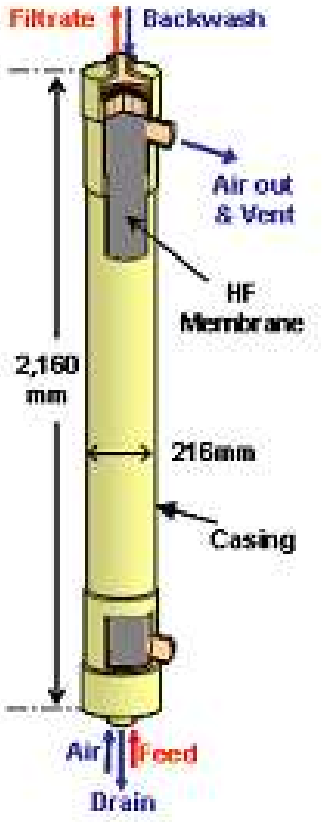
### 6.3.1 TORAY UF MEMBRANES

The Toray HFUG-2020AN membrane is made of PVDF (Polyvinylidene Fluoride) with a flow direction from outside to inside. The Toray HFUG-2020AN module has a pore size of 0.01 microns. Unlike many other membranes in the industry, Toray's membranes have been manufactured with a TIPS method of spinning, allowing the membrane to operate at a very high filtration flux with fewer fiber breaks when compared to the NIPS method of spinning.

The figure below is from the Toray manual showing the different spinning methods of the modules in the market today versus their fiber strength.




A typical Toray HFUG-2020AN PVDF hollow fiber membrane module is shown to the right.




Membrane preparation technology is divided into two categories:

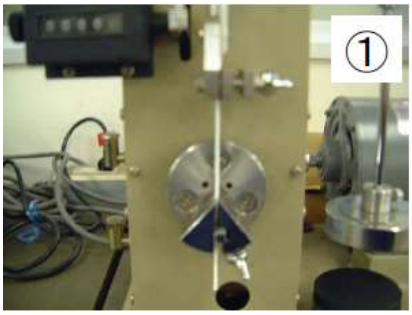
- Thermally Induced Phase Separation (TIPS)
- Non-Solvent Induced Phase Separation (NIPS)

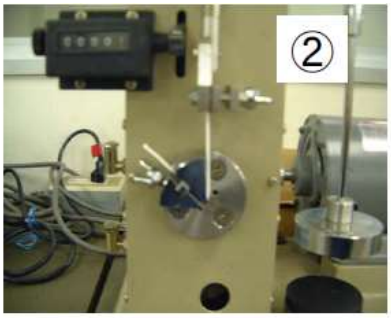
Usually, the “non-solvent” in the NIPS method is water. In this methodology, the porous membrane structure is obtained by contacting a polymer in the water. The water lowers the solubility of the polymer and the membrane is created. On the other hand, the TIPS methodology is based on the use of a partial solvent which can dissolve the polymer at high temperature, but will not be able to keep it dissolved as it is cooled down. Cooling drives the phase separation and the creation of the membrane.

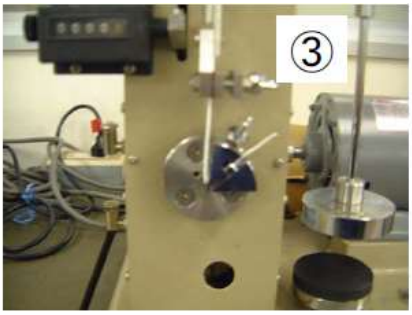
The TIPS technology offered by $H_2O$ innovation through the use of the Toray modules will result in better overall performance for the plant in terms of chemical resistance (and therefore better cleanability and long-term performance) and fiber integrity. The following two quotes have been extracted from N. Li; A. Fane; W. Winston; T. Matsuura. 2008. Advanced Membrane Technology and Applications, Wiley.

*"In the case of the NIPS process, once the fine layer is formed on the surface, the layer disturbs further diffusion and permeation of the non-solvent towards the inner part after that, and the asymmetrical structure is more easily formed. On the other hand, in the case of the TIPS process, even if the fine layer is formed on the surface in the beginning, the structure does not become so asymmetric as in the NIPS process and tends to become comparatively uniform along the membrane thickness direction because the finer layer does not disturb thermal diffusion."*

*"Due to the prolongation of the useful life required for membrane products, the Thermally Induced Phase Separation Process has been attracting attention in recent years because the process has*




*an advantage that a high-strength membrane with a high degree of crystallinity can be easily obtained because the membrane is prepared by heating at a temperature higher than the melting temperature of the polymer used."*

## 6.4 THE H2O INNOVATION ADVANTAGE

H2O Innovation has been involved in numerous UF/MF, RO/NF, MBR and conventional filtration projects and our staff has designed and delivered many other types of treatment plants throughout their careers. We have delivered large and highly specified projects for industrial customers with values over $10M in capital cost. On the municipal side we have delivered several UF facilities over 10 MGD. We have provided letters of recommendations from our clients over a range of UF and Containerized projects in **Appendix R**. As presented, our clients endorse H2O Innovation's professionalism, care, and commitment to provide the highest quality of service and support, before, during, and after execution of projects.

Additionally, our clients including owners, engineers and contractors have been very satisfied with the H2O Innovation project approach from start to completion. Below are some example quotations from our customers:

*"…From initial design through to performance testing the project was an overwhelming success. It was completed within fourteen months and $H_2O$ Innovation met or exceeded their schedule commitments. As the project manager for this facility upgrade, I can attest to the professionalism, technical capabilities and responsiveness of $H_2O$ Innovation's team. I would highly recommend H2O Innovation as a water and wastewater treatment company and would be happy to provide further comments regarding our experience working with them."* – Christian Brinegar, Facilities Engineer, Cummins Inc.

*"…The reliability and quality of the H[2]O Innovation team has been very professional and has responded efficiently with their support of the membrane equipment. H[2]O Innovation has met or exceeded all expectations set by the City and continues to demonstrate their commitment to customer satisfaction."* – Thomas Hinson, Water Plant Manager, Public Utilities Department City of Delaware, Ohio

*"…H[2]OI delivered on its commitments in terms of engineering requirements, quality of manufactured components, equipment delivery schedule, and system commissioning. H[2]OI managed their resources and project teams efficiently during the delivery of our project as this was demonstrated through their attention to detail and ability to respond quickly to any issues that arose. …Given the challenging conditions and timeframe, the commissioning and start-up of the ultrafiltration system was fast and efficient."* – Dale Tooker, District Manager, Clifton Water District

*"…I just want to let you know that in my 23 years in the water/wastewater industry, H[2]O Innovation has been one of the best membrane system suppliers to work with."* – RJ Muha, Construction Superintendent, Pepper Lawson Waterworks

### 6.4.1 PERSONNEL EXPERIENCE

Our Engineering and Operational Recourses are well committed and devoted to accomplishing milestones at every step of the project in a timely and professional manner. $H_2O$ Innovation's staff has acquired a substantial amount of water treatment experience throughout their careers. This gives you the confidence that we internally have the knowledge base and experience requirements to execute your project from all aspects (process, mechanical, electrical, drafting, programming/controls, and commissioning). In addition, our extensive organizational structure allows us to dedicate professional Engineers and well-trained operators to supporting our important clients with the goals of the projects. The organizational chart of H2O Innovation is provided in **Appendix S** for your reference.

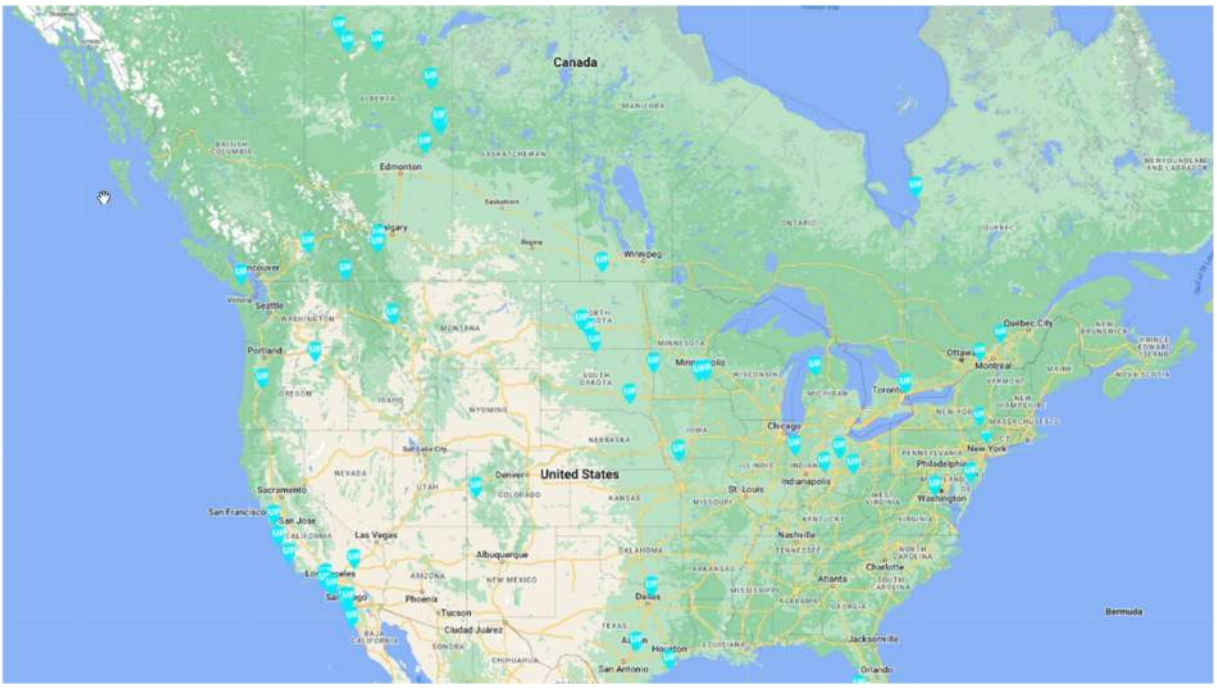
Below are examples of a few of our employees with substantial UF and RO experience; this list represents only a portion of our total engineering team. Resumes for selected staff that will be involved in the Alder Creek WTP Upgrade (City of Sandy, OR) project are included in **Appendix P**.

| Employee Name | Past Employers | Yrs of Experience |
|---|---|---|
| Bill Legge | CBCL/Zenon/GE/AECOM | 27 |
| Nicolas Cormier | H2O Innovation | 6 |
| Bill Youels | Harn RO | 18 |
| Brian Travis | Suez | 4 |
| Denis Guibert | Zenon/GE | 22 |
| Fraser Kent | Zenon/GE/Fibracast | 18 |

| | | |
|---|---|---|
| Greg Bauer | Zenon/GE/Ovivo | 22 |
| Julia Kerwin | $H_2O$ Innovation | 14 |
| Katherine Scott | Zenon/GE | 14 |
| Charles Gaudreault | $H_2O$ Innovation | 10 |
| Michel Sage | Zenon/GE/Suez | 25 |
| Martin Bordeleau | $H_2O$ Innovation | 20 |
| Mike Humphreys | Hydranautics / Membrane Systems / $H_2O$ Innovation | 40 |
| Philippe Leroux | $H_2O$ Innovation | 18 |
| Shayan Yaghoubi | $H_2O$ Innovation / Hatch/ Pure Aqua | 8 |
| Sébastien Barbeau | $H_2O$ Innovation / Tetra Tech | 17 |

### 6.4.2 SIMILAR PROJECT EXPERIENCE

The following maps illustrate our UF footprint for operating facilities in North America. To illustrate the depth of our experience, we have provided detailed UF reference lists in Appendix Q, including location, capacity and time in service for each plant. In this list you will see that we have numerous plants of size and complexity, similar to the proposed City of Sandy water treatment plant.



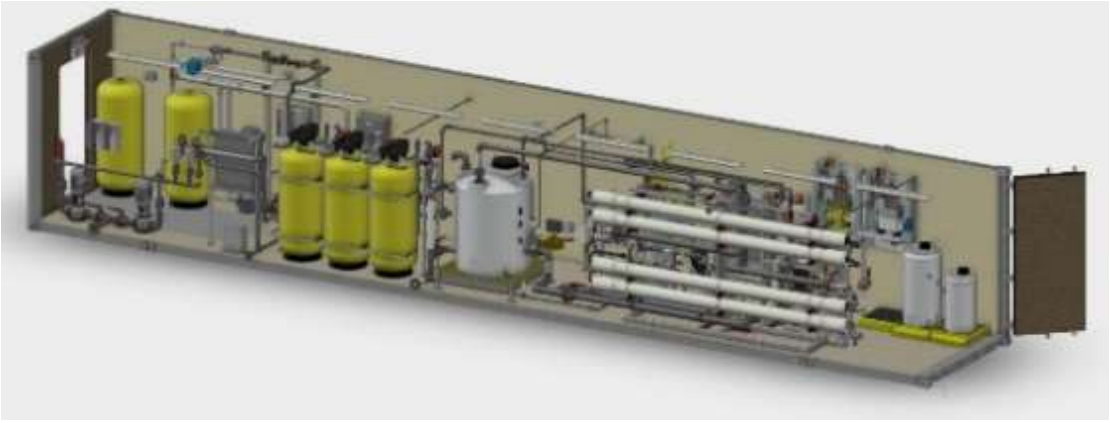
H2O Innovation has successfully executed many containerized treatment systems, a few of which are showcased below.

Two containerized UF systems supplied for a recent industrial customer in the Province of Quebec, Canada.


Two containerized UF systems supplied for a recent industrial customer in the State of North Carolina, USA.

Multiple containerized treatment systems, including UF and RO, for a municipal drinking water customer in State of California, USA.

Multiple containerized treatment systems, including MMF and RO, for a drinking water application in Province of Quebec, Canada.



In addition, the following five facilities represent major membrane filtration systems previously executed by H2O Innovation which can be considered similar to the City of Sandy in terms of feed water quality and application. Four of the five projects listed below include the Toray UF membrane module. For a full list of H2O Innovation ultrafiltration plants, please refer to Appendix Q.

| Delaware, OH, USA | |
|---|---|
| Market: | Municipal |
| Project type: | UF and NF |
| Application: | Drinking Water |
| Type of water: | Both ground water and surface water sources |
| Capacity/Treated flow rate: | 6.75 MGD for UF System<br>5.17 MGD for NF System |
| Number of trains: | 5 NF trains – Three (3) on surface water and two (2) on GW |
| Membrane supplier: | UF: Toray HFU-2020N<br>NF: ESPA4-LD elements from Hydranautics |
| Project completion date: | 2014 |
| Customer/Plant Operator – Contact information: | Water Manager:<br>Tom Hinson – (740) 203-1900<br>Director of Public Utilities:<br>Brad Stanton – (740) 203-1900 |

| Sherman, TX, USA | |
|---|---|
| Market: | Municipal |
| Project type: | UF and RO |
| Application: | Drinking Water |
| Type of water: | Lake Texoma |
| Pretreatment Strategy: | Possibility of potassium permanganate and copper sulfate |
| Capacity/Treated flow rate: | 11.3 MGD UF, 5.0 MGD RO |
| Number of trains: | 5 trains UF, 2 trains RO |
| Membrane supplier: | Toray HFU-2020N and Toray TMG20D |
| Project completion date: | Winter 2018 |
| Customer/Plant Operator – Contact information: | Greater Texoma Utility Authority<br>Jim Cross, Water System Manager<br>(903) 892-7258 |
| Design Engineer – Contact information: | Jacobs (formerly CH2M)<br>Brian Fuerst<br>(469) 941-8888<br>brian.fuerst@jacobs.com |

## Clifton Water District Ultrafiltration WTP, CO

| | |
|---|---|
| Market: | Municipal |
| Project type: | UF |
| Application: | Drinking water |
| Type of water: | Treating settled water from surface water supply |
| Pretreatment Strategy: | coagulant addition, flocculation, sedimentation with lamella plate settlers |
| Capacity/Treated flow rate: | 12 MGD |
| Number of trains: | 8 trains (N-2 design) |
| Membrane supplier: | Toray HFU-2020N |
| Project completion date: | Spring 2015 |
| Customer/Plant Operator – Contact information: | Isaac Brown – Water Treatment Supervisor<br>isaacb@cliftonwaterdistrict.org<br>970-434-5571 |
| Design Engineer – Contact Information: | Carollo Engineers<br>Dan Hugaboom<br>dhugaboom@carollo.com<br>(208) 376-2288 |

## Town of Innisfil WTP, ON, Canada

| | |
|---|---|
| Market: | Municipal |
| Project type: | UF |
| Application: | Potable Water Treatment, Two-Stage UF (Retrofit) |
| Type of water: | Surface water |
| Pre/Post-treatment Strategy: | UV and GAC |
| Capacity/Treated flow rate: | 10 MGD (Expandable to 22.5 MGD) |
| Number of trains: | 6 trains (4 primary + 2 secondary trains) |
| Membrane supplier: | Toray HFU-2020N |
| Project completion date: | January 2018 (first stage only)<br>November 2018 (second stage) |
| Customer/Plant Operator – Contact information: | Corporation of the Town of Innisfil<br>Rama Badam – InnServices<br>rbadam@innservices.co<br>(705) 436-3740, ext 4632 |
| Design Engineer – Contact Information: | Jesus Garcia Aleman<br>Jacobs (formerly CH2M)<br>jesus.garcia-aleman@jacobs.com<br>Phone: 416-371-8199 |

## Montevina, CA, USA

| | |
|---|---|
| Market: | Municipal |
| Project type: | UF |
| Application: | Drinking water |
| Type of water: | Treating settled water from surface water supply |
| Capacity/Treated flow rate: | 30 MGD |
| Number of trains: | 7 |
| Membrane supplier: | BASF/inge dizzer XL 09 MB70 |
| Project completion date: | 2018 |
| Customer/Plant Operator –<br>Contact information: | San Jose Water Company<br>Joshua Karpel<br>(408) 309-6906 |
| Design Engineer –<br>Contact Information: | Scott Joslyn<br>HDR<br>(916) 202-0166 |

H2OI also developed an extensive list of prefab and containerized installation featuring diverse treatment methodologies, many of which uses Ultrafiltration.

H2OI already built many Flexbox UF plants almost identical to the membrane systems presented in this offer.

Appendix Q provides references to several of our completed prefabricated and containerized systems.

### 6.4.3 EXPERIENCE OF MEM TREATING SURFACE WATER IN OR AND WA STATES

UF references from membrane manufacturer:

1. City of Lebanon with H2O Innovation – 224 HFU-2020AN shipped Sept. 2018.
2. Buell – 12 HFS-2020 - July 2012 (upgraded from12 HFS-2020 to 12 HFUG-2020AN in November 2019)
3. Young's Life – 8 HFS-2020 – Sept. 2013 (upgraded to 8 HFUG-2020AN in May 2021)
4. Arch Cape – 10 HFS-2020 – Dec. 2013

# APPENDIX A

# Proposal Form

# (Envelope 1)

# SECTION 00 40 00 PROPOSAL FORM

**PROPOSAL FOR:**
CITY OF SANDY, OREGON. ALDER CREEK UPGRADE PROJECT

## ARTICLE 1 – PROPOSAL RECIPIENT

1.01 THIS PROPOSAL IS SUBMITTED TO:

City of Sandy, OR
Attn: Jenny Coker, PE, Public Works Director.
Address: 39250 Pioneer Boulevard, Sandy, OR 97055
Phone: (503) 668-6927
Email: Jcoker@ci.sandy.or.us

## ARTICLE 2 – PROPOSER'S ACKNOWLEDGEMENTS

2.01 The undersigned Proposer proposes and agrees, if this Proposal is accepted, to enter into an Agreement with the Buyer, in the form included in the Proposal Documents, to furnish the Goods and Special Services as specified or indicated in the Proposal Documents for the prices and within the times indicated in this Proposal and in accordance with all other terms and conditions specified in the Proposal Documents.

2.02 Proposer accepts all of the terms and conditions of the Proposal Documents, including and without limitation, those dealing with the disposition of Proposal security. The Proposal will remain subject to acceptance for 90 days after the Proposal Closing Time, or for such longer period of time that Proposer may agree to in writing upon request of the Buyer.

2.03 Proposer accepts the provisions of the Agreement for liquidated damages in the event of its failure to furnish the Goods and Special Services in accordance with the schedule set forth in the Agreement.

2.04 Proposer accepts the provisions of the Agreement for assignment of the Contract for furnishing Goods and Special Services.

2.05 Proprietary Membrane System Proposers Acknowledgements

A. The Proposer acknowledges that it is the intent of the Proposal Documents to allow the Buyer to select a Proposer that will provide Goods and Special Services that conforms to the requirements of the Procurement Documents.

B. The Proposer acknowledges that they are a provider of membrane filtration equipment that incorporates proprietary design features. The Proposer recognizes that because of the inherent differences in the proprietary membrane equipment, the Proposal Documents include both equipment that is proprietary to the Proposer and requirements for equipment that is used in municipal membrane water treatment plants.

C. The Proposer acknowledges that during the development of the Proposal Documents, the Proposer has established design (i.e., capacity, membrane flux, redundancy), operational (i.e., energy, chemicals, chemical cleaning intervals,) and equipment requirements specific to the Proposer. The Proposer recognizes that the establishment of such design criteria is based upon the results of professional judgment and treatment of other similar water with site-specific considerations of the Buyer.

D. The Proposer acknowledges that it has reviewed the design criteria and that the Proposal offered will meet the design and operational criteria as described in the Proposal Documents. In submitting the Proposal, the Proposer agrees to provide Goods to meet or exceed the requirements required by the Proposal Documents.

E. The Proposer acknowledges that in accordance with Article 14 of Section 00 20 00, Instructions to Proposers, the Buyer has reserved its rights.

F. The Proposer acknowledges that the selection of a proprietary membrane equipment supplier (Proposer) is the sole decision of the Buyer and such decisions are final.

2.06 The Proposer accepts that the Contract Price offering for Special Engineering Services is fair and reasonable.

2.07 The Proposer accepts that the Buyer retains the right to issue a "Notice to Commence Fabrication" for the Membrane Filtration System. The Proposer acknowledges that until the "Notice to Commence Fabrication" is issued, the Buyer is not obligated to any monetary commitment associated with this Contract beyond that which is associated with Special Engineering Services and Pilot Testing.

A. A "Notice to Commence Fabrication" may be issued at any time for a period of 365 days after the Effective Date of the Agreement.

B. Upon the issuance of the "Notice to Commence Fabrication" the Contract Price for Membrane Units and Ancillary Equipment shall remain valid until 365 days after the Effective Date of the Agreement. If the Notice to Commence Fabrication is issued after 365 days of the Effective Date of the Agreement, the Contract Price will be adjusted through Change Order by the ratio of the Consumer Price Index (CPI) of the CPI of month that the Notice to Commence Fabrication is issued to the CPI of the month 365 days after the Effective Date of the Agreement.

2.08 The Proposer accepts that if the Proposer submits a Membrane Module Warranty Period in excess of 120-months, the Proposal shall be rejected as non-responsive with the requirements of the Proposal Documents.

2.09 Proposer acknowledges that their Proposal is being submitted to a public agency and that the Proposal will become public information as of the Proposal Closing Time. Additionally, the Proposer acknowledges that the Proposal and subsequent Proposal evaluation and recommendations to award a contract will become public information. In submitting this Proposal, the Proposer waives all rights pertaining to the confidentiality of documents whether or not specifically stated or implied. Exceptions will be a basis for declaring the Proposal non-responsive. If a Proposal contains any information that the Proposer believes is exempt from disclosure under the various grounds specified in the Oregon Public Records Law, the Proposer must clearly designate each such portion of its proposal as exempt at the time of proposal submission, along with a justification and citation to the legal authority relied upon. Identifying the Proposal, in whole, as exempt from disclosure is not acceptable. Failure to identify specific portions of the Proposal as exempt shall be deemed a waiver of any future claim of that information as exempt. The City will make available to any person requesting information, through the City processes for disclosure of public records, any and all information submitted as a result of this RFP not exempted from disclosure without obtaining permission from any Proposer to do so. City may also, in its sole discretion, elect to publish all such information at any time, regardless of whether or not a public records request has been received. However, if a public records request is made for material marked by the Proposer as exempt, the City will attempt to notify the impacted Proposer prior to any release of the material. Application of the Oregon Public Records Law by the City will determine whether any information is actually exempt from disclosure. The City accepts no liability for the release of any information submitted.

2.10 The Proposal shall be based upon design criteria, including maximum membrane flux established in the membrane procurement documents.

2.11 The Proposal Pricing shall include all applicable taxes and duties.

**ARTICLE 3 – PROPOSER'S REPRESENTATIONS**

3.01 In submitting this Proposal, Proposer represents, as set forth in the Agreement, that:

A. Proposer has examined and carefully studied the Proposal Documents, the other related data identified in the Proposal Documents, and the following Addenda, receipt of which is hereby acknowledged.

| ADDENDUM NO. | ADDENDUM DATE |
|---|---|
| Addendum 1 | 2/22/2024 |
| Addendum 2 | 2/22/2024 |
| Addendum 3 | 3/5/2024 |
| Addendum 4 | 3/18/2024 |
| Addendum 5 | 3/19/2024 |
| | |

B. If specified, or if in Proposers judgment, any local condition may affect cost, progress or the furnishing of Goods and Special Services, Proposer has visited the Point of Destination and become familiar with and is satisfied as to the local conditions that may affect cost, progress, or the furnishing of Goods and Special Services.

C. Proposer is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of Goods and Special Services.

D. Proposer has carefully studied and correlated the information known to Proposer, and information and observations obtained from Proposers visits, if any, to the Point of Destination with the Proposal Documents.

E. Proposer has given Buyer written notice of all conflicts, errors, omissions, ambiguities, or discrepancies that Proposer has discovered in the Proposal Documents, and the written resolution thereof by Buyer is acceptable to Proposer.

F. The Proposal Documents are sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Proposal is submitted.

G. Proposer further represents that this Proposal is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Proposer has not directly or indirectly induced or solicited any other Proposer to submit a false or sham Proposal; Proposer has not solicited or induced any individual or entity to refrain from Proposal; and Proposer has not sought by collusion to obtain for itself any advantage over any other Proposer or over the Buyer.

## ARTICLE 4 – BASIS OF PROPOSAL

4.01 Refer to Section 00 41 00, Proposal Pricing Form.

## ARTICLE 5 – TIME OF COMPLETION

5.01 Proposer agrees that the furnishing of Goods and Special Services will conform to the schedule set forth in Article 5 of the Agreement.

## ARTICLE 6 – ATTACHMENTS TO THIS PROPOSAL

6.01 Proposals must include submission of two sealed envelopes – Envelope No. 1 and Envelope No. 2 – as detailed below and must follow the additional requirements in Article 9 of Section 00 20 00, Instructions to Proposers to be considered responsive..

A. Sealed Envelope No. 1:

1. Required Proposer qualifications statement, accompanying information and supporting data, including:

   a. The completed Proposal Form (Section 00 40 00, Proposal Form)

   b. The completed Proposal Bond (Section 00 61 27, Proposal Bond)

   c. The evidence of the authority to sign.

   d. The draft pilot test plan, per Section 11 30 20, Performance Pilot Testing of Membrane Equipment.

2. The Seller (Membrane System Supplier or MSS) company and organization information

   a. Provide the following information on the Seller (MSS) portion of the parent company, and the parent company itself, as appropriate:

      1) Parent Company:

         a) A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year.

         b) Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.)

         c) The most recent independent audit report.

         d) Experience in the municipal water and wastewater treatment industry, both in the United States and internationally, and evidence of commitment to the municipal market.

e) Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company.

f) Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend.

2) Seller MSS Company:

a) A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year.

b) Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.)

c) The most recent independent audit report.

d) Documented experience gaining approval for municipal installations through Oregon Health Authority

e) A description of the manufacturing facilities, their current and projected capacities; and their ability to meet delivery of 2 mgd systems in 2024-2025.

f) A minimum of three financial references with phone numbers; and, upon request of the City, each prospective proposer shall provide written authorization for such references to provide financial information to the City.

g) Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company.

h) Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend.

b. Membrane fiber and module information

1) Provide the following information on the membrane fiber and module proposed for use on this project:

a) Identified Membrane Element Manufacturer (MEM)

b) Documented experience of MEM treating surface water in western Washington and Oregon

c. Membrane system information

1) Provide the following information on the membrane filtration system proposed for use on this project:

a) A complete list of representative operational installations (with the product you have proposed for this project) within previous 10 years. Include the following information:

i. Plant Location

ii. Plant capacity

iii. Date of installation (equipment startup)

iv. Source water characteristics (i.e., secondary effluent, lake, reservoir, river, etc.). Clearly identify applications using coagulant addition for removal of phosphorus from municipal secondary effluent.

v. Type of pretreatment (coagulant, dose, type of pretreatment).

vi. Contact names, phone, e-mail. Proposer grants the City the right to contact any reference provided.

d. Identification and Qualifications of MSS's Project Manager and Resident Representative:

a) For the MSS's proposed project manager and resident representative (for Phase III – Post Operational Performance Test), provide name and resume listing applicable experience and references.

b) The MSS's project manager shall serve as the primary contact for the Buyer's project from receipt of Proposal through facility startup.

c) The MSS's project manager shall not be changed without the written consent of the Buyer and the Engineer.

d) Provide similar information for a designated secondary contact.

e. Proposed Performance Schedule: A detailed schedule meeting all of the requirements of Article 5 in Section 00 52 00, Procurement Agreement.

f. Project Delivery Plan:

1) A detailed plan for the delivery including the following elements at a minimum:

a) Engineering Services as described in Section 01 01 00, Summary of Goods and Special Services:

i. Identify engineering staff

ii. Level of effort

iii. Schedule

iv. Quality Assurance/Quality Control plan

v. Change Management Plan

vi. Communication Plan

b) Fabrication

i. Describe Proposer's plan to maintain and communicate schedule as it pertains to fabrication of the membrane system. What is Proposer's plan if fabrication schedule slips?

c) Installation Services

i. Describe Proposer's plan to meet the service requirements of Section 01 62 00, Installation of Membrane Equipment and Section 01 73 00, Installation, Operation and Maintenance Manuals.

d) Training

i. Describe Proposer's plan to meet the training requirements outlined in Section 01 73 10, Training of Operation and Maintenance Personnel.

e) Commissioning

i. Describe Proposer's plan to meet the commissioning requirements outlined in Section 01 66 00, Commissioning of Membrane Equipment.

f) One-Year onsite services as specified in 01 67 00, Acceptance Testing of Membrane Equipment.

i. Identify onsite and in office support staff

ii. Level of effort

iii. Quality Assurance/Quality Control plan

iv. Change Management Plan

v. Communication Plan

g. Verification of Performance Requirements

1) Performance Requirements:

a) Production Capacity: Confirm that the system will meet production capacity requirements for the range of feedwater quality stated in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

b) Membrane System Recovery: Verify conformance with the membrane system recovery requirements of Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

c) Membrane Filtered Water Quality: Confirm that system will meet requirements for membrane filtered water quality stated in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

d) Membrane Integrity Test System (MITS):

i. Describe monitoring parameters, instrumentation, and alarm thresholds for the online membrane integrity system.

ii. Describe verification, identification, and isolation procedures.

iii. Provide documentation describing the calculation of pathogen log removal values from the system based on the decay test results.

iv. State the time required to perform a MIT on each membrane train and the membrane system.

e) Pretreatment System Compatibility:

i. Provide certification that the proposed membrane system is compatible with the addition of chemicals to the feedwater as described in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

ii. Identify any limits to the concentration, contact time, or product thereof (e.g., ppm-hours) for any of the potential pretreatment chemicals listed in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System. If no adverse impacts are expected, so state.

h. Operations Descriptions:

a) Describe procedures for access, inspection, removal, repair, and replacement of membrane modules.

b) Describe startup and normal operation procedures, as well as methods for maintaining and recovering membrane system permeability (backwashing, maintenance cleans, CIPs, tank draining, etc., as applicable).

c) Shutdown/Storage/Startup:

i. Describe procedures for complete shutdown, storage of the membranes and related equipment, and startup.

ii. Detail process equipment necessary to accomplish storage of the plant.

iii. Detail chemical(s) required and estimated annual use for storage.

iv. Detail chemical(s) used for membrane delivery and storage on site during construction and recommendation for chemical(s) disposal.

v. Detail, if necessary, minimal membrane flow requirement to preserve membrane integrity during storage.

i. Statement of SCADA Software and Compatibility

a) Identify MSS's standard PLC applications software and SCS applications software.

b) Identify alternate SCS software systems, if any, utilized by MSS.

3. Letter from Proposer's surety company indicating Proposer is willing and able to provide the specified Payment and Performance Bonds.

4. Letter from Proposer's surety company indicating Proposer is willing and able to provide a separate bond to cover Warranty obligations through the Warranty period.

5. Letter from Proposer's insurance broker indicating Proposer is willing and able the specified Insurance.

6. Letter from an officer of Proposer's firm stating that Proposer takes no exceptions to the Form of Agreement.

7. A complete copy of the Proposal Documents, including Addenda. The front cover of each Volume of the Proposal Documents and Addenda shall be signed and dated by the individual designated in the Proposal Form. The documents shall be otherwise unaltered.

B. Sealed Envelope No. 2:

1. The completed Proposal Pricing Form (Section 00 41 00, Proposal Pricing Form)

2. Additive bid item for additional capacity; see Section 11 30 00, Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

3. Additive bid item for membrane container storage pricing.

a. If the Buyer is unable to accept and store the membrane containers, the Seller shall provide a service for storing the containers at a secure location. Buyer shall provide a price per month of storage, for up to 6 months.

**ARTICLE 7 – DEFINED TERMS**

7.01 The terms used in this Proposal have the meanings indicated in the Procurement General Conditions. The significance of terms with initial capital letters is described in the Procurement General Conditions.

## ARTICLE 8 – PROPOSAL SUBMITTAL

8.01 Respectfully submitted on (date) April 11th, 2024

This Proposal is submitted by:

**Corporation**

H2O Innovation USA, Inc.
(Corporation Name)

Delaware
(State of Incorporation)

(Signature of Officer Authorized to Sign)

Fraser Kent, Vice President - Technology Sales
(Printed or Typed Name and Title of Officer Authorized to Sign)

(CORPORATE SEAL)

(Signature of Attesting Party)

Edith Allain - Corporate Secretary
(Printed or Typed Name Attesting Party)

8900, 109th Ave N, suite 1000, Champlin, MN 55316 United States
(Corporation Business Address)

763.566.8961
(Phone No.)

Person to whom notices and correspondences regarding this Proposal should be addressed to:

1048 La Mirada Ct., Vista, CA, 92081, United States
(Corporation Business Address)

Shayan Yaghoubi - Regional Technical Sales Manager

619.884.5834
(Phone No.)

END OF SECTION

# APPENDIX B

# Proposal Bond

# (Envelope 1)

# SECTION 00 61 27 PROPOSAL BOND FORM
# Document A310™ – 2010
# Conforms with The American Institute of Architects
# AIA Document 310

Bond Number: BDTO-470002-024-002

*Bid Bond*

**CONTRACTOR:**
*(Name, legal status, and address)*

H2O INNOVATION USA, INC.
8900 109th Ave N - Suite 1000,
Champlin, MN 55316, USA

**SURETY:**
*(Name, legal status, and principal place of business)*

LIBERTY MUTUAL INSURANCE COMPANY
2200 Renaissance Blvd., suite 400
King of Prussia, PA. 19406

State of Inc: Massachusetts

**OWNER:**
*(Name, legal status, and address)*

City Of Sandy
39250 Pioneer Boulevard Sandy, OR 97055

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

**BOND AMOUNT:** FIVE PERCENT OF THE TOTAL BID PRICE (5%)

**PROJECT:**
*(Name, location or address, and Project number, if any)*

City of Sandy, Alder Creek Water Treatment Plant Upgrade Project - 2002006267
City of Sandy, c/o Jenny Coker
39250 Pioneer Blvd., Sandy, OR 97055
(503) 668-6927, Jcoker@ci.sandy.or.us

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null

and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 13th day of March, 2024

H2O INNOVATION USA, INC.

By: _____ (Seal)
(Principal)

_____
(Witness)

Vice President - Technology Sales
(Title)

LIBERTY MUTUAL INSURANCE COMPANY

By: _____ (Seal)
(Surety)

SEE ATTACHED NOTARY ACKNOWLEDGMENT
(Witness)

Lisa Betancur, Attorney-In-Fact
(Title)

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

**Seal No. 5089**

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Item # 3.

Liberty Mutual SURETY

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: 8210551-969099

# POWER OF ATTORNEY

**KNOWN ALL PERSONS BY THESE PRESENTS:** That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Lisa Betancur, Donna Marie Borja, Alison Chambers, David W. Garese, Robert J. Garese, Maria Pamela Duran Rufino, A. Catherine Skeen, Brooke A. Skeen

all of the city of Sacramento state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

**IN WITNESS WHEREOF,** this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 4th day of August, 2023.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 4th day of August, 2023 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

**IN WITNESS WHEREOF,** I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2025
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

**ARTICLE IV – OFFICERS:** Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

**ARTICLE XIII – Execution of Contracts:** Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

**Certificate of Designation** – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

**Authorization** – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

**IN TESTIMONY WHEREOF,** I have hereunto set my hand and affixed the seals of said Companies this 13th day of March, 2024.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

# ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Sacramento )

On March 13, 2024 before me, Donna Marie Borja, Notary Public
(insert name and title of the officer)

personally appeared Lisa Betancur,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

DONNA MARIE BORJA
COMMISSION #2430459
NOTARY PUBLIC - CALIFORNIA
SOLANO COUNTY
MY COMMISSION EXPIRES
DECEMBER 12, 2026

Signature Donna Marie Borja (Seal)

# APPENDIX C

# Evidence of Authority to Sign

# (Envelope 1)

Submitted to: City of Sandy, Oregon

Project: City of Sandy, OR
Alder Creek Water Treatment Plant Upgrade
Membrane Equipment Procurement

## POWER OF ATTORNEY

I, the undersigned Frédéric Dugré, CEO of $H_2O$ Innovation USA, Inc., a corporation organized and existing under the laws of Delaware, hereby declare and certify that **Denis Guibert, Vice President - Water Technologies & Services** and/or **Fraser Kent, Vice President – Technology Sales** is/are duly authorized to make, sign, amend and execute any and all documents on behalf of $H_2O$ Innovation USA, Inc. in relation to the Project described above, including, without limitation, proposal, bonds, contract and/or any other ancillary documents, the whole pursuant to $H_2O$ Innovation USA, Inc.'s Delegation of Authority Policy.

Signed this 29th day of February 2024.

Frédéric Dugré
CEO
$H_2O$ Innovation USA, Inc.
251 Little Falls Drive Wilmington
Delaware 19808, USA

Corporate seal attested by Edith Allain, Secretary.

# APPENDIX D

# Annual Report for the Parent and MSS Company (Envelope 1)

# ANNUAL REPORT

Fiscal year ended on June 30, 2023

For additional information:
Investor Relations
*investor@h2oinnovation.com*

Trading symbols:
TSX: HEO
Growth Paris: MNEMO: ALHEO
OTCQX: HEOFF

Financial reports, annual reports and press releases are accessible on our website *www.h2oinnovation.com* and on SEDAR+.

**TABLE OF CONTENT**

## A WORD FROM THE PRESIDENT

The 2023 fiscal year was marked by strong organic growth, which was driven by various factors, including global population growth, aging infrastructure, increasingly stringent regulations, and companies' growing need to preserve water through reuse in order to attain a water-positive status. We have noted increasing customer enthusiasm not only for the sustainability dimension of our ESG (Environment, Social, and Governance) initiative, but also for the added value it brings. For example, water reuse helps companies that rely on water for their manufacturing processes to mitigate some of the operational risks they face. This recent shift is creating an array of opportunities for $H_2O$ Innovation, particularly in the industrial sector, which will enable us to improve our margin profile and to generate new avenues for selling additional products and services.

Seizing the post-pandemic momentum, we launched innovative new products for our business line that combines our PWT-Genesys and Piedmont brands. We also secured several large-scale projects for seawater desalination and water treatment plants throughout the world, which resulted in record midyear sales for this business line. $H_2O$ Innovation has reported strong growth over the past year, which is set to increase once the Biden administration's major investment in U.S. water treatment infrastructure materializes. Meanwhile, inflation and rising labour costs proved to be significant challenges for fiscal year 2023. This required careful measures to strike a balance between retaining our workforce, remaining competitive in the recruitment market, and maintaining our profit margins. We look forward to a return to normal on that front in the coming years.

Our financial position is healthier; with an improved cash flow and a consequent reduction in our debt level, we remain optimistic about the future, both in terms of maintaining sustained organic growth above industry averages and in terms of pursuing additional acquisitions that would fast-track the execution of our three-year strategic plan. Moreover, a number of initiatives are already underway to further improve our gross margins and thus increase our adjusted EBITDA margins. Consequently, we remain confident that we will achieve the revenue and adjusted EBITDA margin targets set out in our three-year strategic plan. Access to drinking water around the world has never been a more pressing concern, and we firmly believe in the importance of our role in preserving this vital resource. Our business model based on customer retention, our product and service offering, and our unprecedented order backlog position us as a major player at the leading edge of our industry.

Frédéric Dugré
President, Chief Executive Officer and co-Founder of $H_2O$ Innovation

## $H_2O$ INNOVATION AT A GLANCE

As a complete solution provider, $H_2O$ Innovation designs, manufactures and commissions customized membrane water treatment systems and provides operation and maintenance services as well as a complete line of specialty products such as chemicals, consumables, couplings, fittings and cartridge filters for multiple markets. In addition, $H_2O$ Innovation provides a full range of maple equipment and related products to maple syrup producers.

Whether it is for the production of drinking water and industrial process water, the reclamation and reuse of water, the desalination of seawater and/or the treatment of wastewater, the solutions provided by $H_2O$ Innovation intend to combine the best available expertise with the most advanced membrane technologies and products. The Corporation's reliable, state-of-the-art, and eco-friendly solutions are customer-focused and intended to reduce end-user costs, optimize the water treatment process, and maximize the efficiency, performance and longevity of water and wastewater treatment utilities.

Through its integrated solutions combining membrane filtration expertise, specialty products and operation and maintenance (O&M), $H_2O$ Innovation is well positioned to address the needs that a customer may have and to **maximize customer retention.**

As part of our Three-Year Strategic Plan which defines our key strategic objectives, we have set the Corporation to perform according to four (4) themes, as shown in the image below, on which we intend to compete enthusiastically for customers, talent, and shareholders.


First, we must **delight our customers** and continuously strive for higher customer satisfaction to build long-term relationships and increase recurring business. We will retain our customers and gain new ones by pushing for **innovation**, challenging the status quo and delivering world-class technology solutions through our products and services. By reinventing ourselves continuously, and by pursuing improvements in our business process, we relentlessly strive for **operational excellence**, which will enable us to become leaner and better integrated. Operational improvements maximize synergies, better leveraging our cost structure and sales organization. To execute this plan and its ambitious objectives, **team engagement** is key; we must create an inspirational and meaningful work environment where people feel safe and have an opportunity to develop talents along their chosen career path.

Water is vital and complex. We simplify water by integrating leading technologies and a trusted team of experts into intelligent solutions, solving water for good. Through innovation and operational excellence, we empower our team to delight our customers and transform our industry while protecting a vital resource: water.

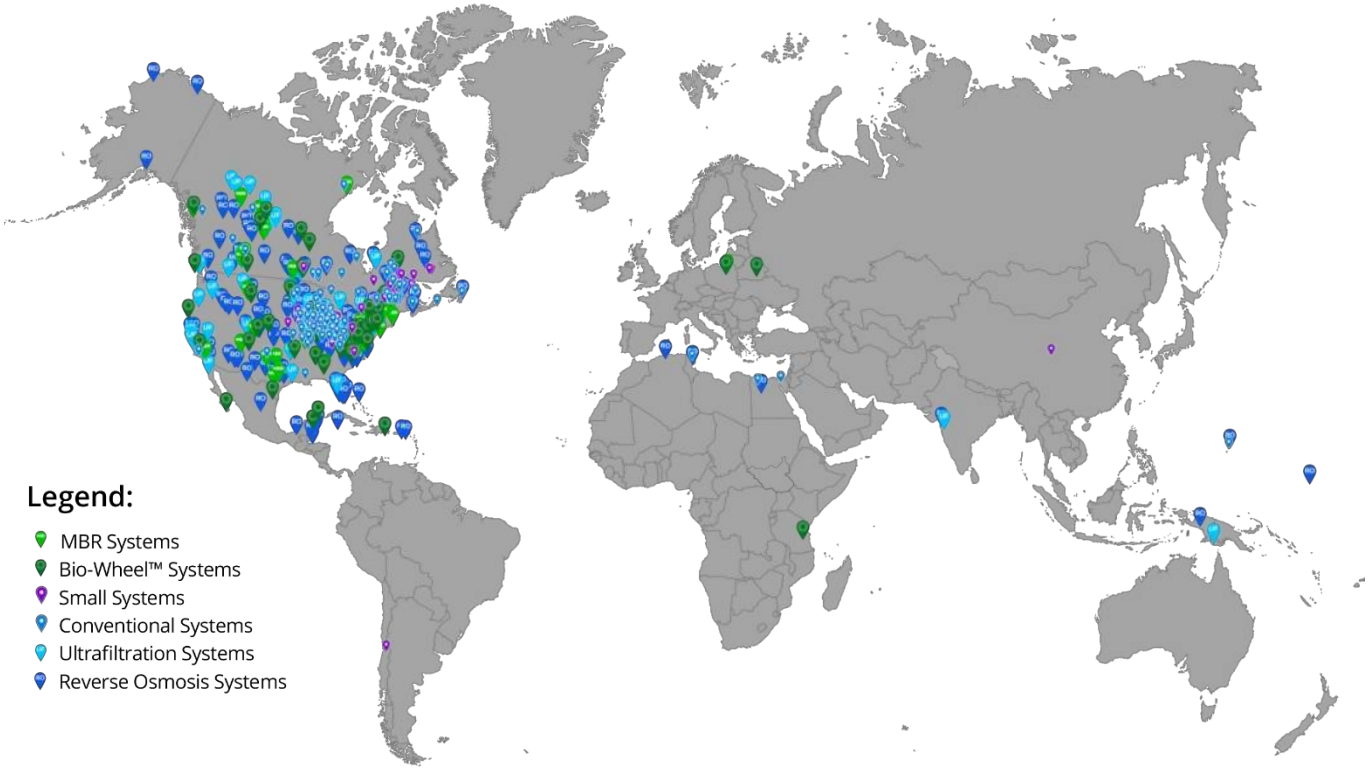
| Number of Employees | Systems Installed in North America | Countries in Which We Export our Specialty Products | Utilities We Operate |
|---|---|---|---|
| **+1,035** | **+800** | **+75** | **+650** |

## WATER TECHNOLOGIES AND SERVICES ("WTS")

$H_2O$ Innovation designs and provides custom-built and integrated water treatment solutions based on membrane filtration technology for municipal, industrial, energy and natural resources end users. The Corporation also provides aftersales services as well as digital solutions (Intelogx™) to monitor and optimize water treatment plants.

$H_2O$ Innovation has now installed more than 800 systems in North America, including all range of applications (drinking water, wastewater, desalination, water reuse, etc.). The Corporation has also developed its own open-source technologies for water treatment systems, the FiberFlex™, and for wastewater treatment systems, the flexMBR™ and the SILO™ (Simple*Independent*Level-Based*Operation). Furthermore, $H_2O$ Innovation has launched a mobile fleet of water and wastewater treatment systems like the FlexBox™ line, which comprises containerized ultrafiltration (UF) or reverse osmosis (RO) systems designed for drinking water treatment, industrial wastewater and water reuse, and the SILO™ system, which employs membrane bioreactor (MBR) technology and is specifically designed for wastewater and water reuse treatment.

## REFERENCE MAP



## WTS BUSINESS PILLAR HIGHLIGHTS

- Throughout the 2023 fiscal year, the WTS business pillar continued its industrial diversification by delivering multiple industrial projects. Most notably, it provided a water treatment system to a U.S. manufacturing plant associated with a global leader in smart building solutions. It also supplied a variety of municipal capital equipment projects for drinking water, wastewater, and water reuse, including San Diego's flagship water reuse project. On June 30, 2023, the capital equipment projects for industrial customers represented **36.7%** of the backlog, whereas **63.3%** were dedicated to municipal customers.

- Throughout the year, the WTS team was awarded more than **30** new water reuse, wastewater, desalination and water projects, totaling $36.9 M, pushing the project and equipment backlog to $58.8 M at the end of June 30, 2023.

- On March 2, 2023, $H_2O$ Innovation announced the sponsorship of a limited craft beer developed in collaboration with Fox City Brewing made with **purified recycled water** from Las Virgenes Municipal Water District (LVMWD). Attendees of the 2023 WateReuse Symposium held in Atlanta were offered the opportunity to taste the beer, which is called Revival Lager.

### PROJECTS EXECUTION UPDATE AS OF JUNE 30, 2023

| ENGINEERING | FABRICATION | COMMISSIONING | PILOTING |
|---|---|---|---|
| **35** (-1) | **11** (-2) | **8** (-1) | **2**(-) |



## SPECIALTY PRODUCTS ("SP")

$H_2O$ Innovation offers a complete line of specialty chemicals, consumables, components and specialized products for the water industry through PWT™, Genesys™ and Piedmont™, and for the maple industry through $H_2O$ Innovation Maple and Leader™. The Corporation is now exporting its specialty products in over 75 countries.

PWT and Genesys, which belong to our Specialty Chemicals Group, focus on chemicals manufacturing and supply for the membrane industry, with a product line developed around its unique dendrimer-based phosphate-free, antiscalant chemistry for scale and fouling control. Our Specialty Chemicals Group also manufactures its own range of specialty reverse osmosis (RO) membrane chemicals, including antiscalants, flocculants, biocides, and cleaning chemicals.

Piedmont is a global leader in components and consumables, corrosion-resistant equipment for desalination plants and offers flexible grooved-end couplings, fiberglass reinforced polyester (FRP) cartridge filter housings, self-cleaning disc and screen filters, bag filters, cartridges, and strainers.

$H_2O$ Innovation Maple and Leader offer a complete line of maple farming equipment dedicated to maple syrup production to help the maple producers increase their syrup production while reducing their energy consumption and improving efficiency.

## DISTRIBUTION NETWORK


PWT GENESYS Piedmont h2o innovation LEADER

## SP BUSINESS PILLAR HIGHLIGHTS

- Piedmont experienced a **record year**, during which it delivered bigger scale projects than ever. Most of these projects were for customers located in the Middle East. Overall, during the year ended June 30, 2023, Piedmont delivered 1,022 orders to 174 different customers in 43 different countries.

- On June 30, 2022, $H_2O$ Innovation completed the acquisition of substantially all of the assets of Leader Evaporator Co. Inc. (Leader) to **strengthen its position in the maple industry**. Leader has been developing, manufacturing and selling maple farming equipment and products for more than 130 years to maple syrup producers located mainly in the United States. $H_2O$ Innovation and Leader maple syrup products and equipment are now being offered through a larger distribution network in the United States, with nearly 80 distributors in 10 states.

- On July 20, 2022, the Piedmont business line joined PWT and Genesys to create a unique business line dedicated to specialty chemicals, consumables, and components. The consolidation of the supply of the brands under **one commercial team** allows $H_2O$ Innovation to leverage the synergies between its sales team and distribution network while maintaining the product branding to better support its distributors and clients around the world.

- On November 7, 2022, the Maple business line announced the launch of the "H2GO" container, a **unique 24/7 self-service** containerized store. The $H_2O$ Innovation team developed this containerized store to ensure that maple syrup producers always have access to all the products they need to carry out their daily operations without having to travel long distances. The labor shortage and the fact that opening hours are often incompatible with the forestry workers' schedules prompted $H_2O$ Innovation to design this new and unique concept. This is the first innovation of its kind in the North American maple syrup industry.

- On March 28, 2023, $H_2O$ Innovation announced that it had successfully performed a cleaning-in-place for cartridge filters at a water treatment facility using its Genesys-PWT membrane cleaners. This new cleaning method could prevent water treatment facilities from disposing of millions of cartridges filters each year, thereby helping them reduce their plastic waste and achieve their sustainability objectives.

## OPERATION AND MAINTENANCE ("O&M")

$H_2O$ Innovation operates, maintains, and repairs water and wastewater treatment systems, distribution equipment, and associated assets for its O&M customers. It also ensures that the water quality meets regulatory requirements. These O&M services are provided through $H_2O$ Innovation and $H_2O$ Innovation Operation and Maintenance L.L.C and, since December 15, 2021, through JCO, Inc. ("JCO") and Environmental Consultants, L.L.C. ("EC").

$H_2O$ Innovation operates over 650 utilities in two Canadian provinces and thirteen U.S. states, mainly on the U.S. Gulf Coast, Southeast, Northeast (New England) and the West Coast.

## REFERENCE MAP


Trusted Utility Partners

ENVIRONMENTAL SERVICES

Environmental Consultants LLC
WATER & WASTEWATER OPERATIONS SPECIALISTS

## O&M BUSINESS PILLAR HIGHLIGHTS

- Throughout the 2023 fiscal year, the O&M business pillar demonstrated its **solidifying position** in the industry by successfully renewing most of its contract portfolio and experienced a record year.

- On March 30, 2023, $H_2O$ Innovation announced that its O&M business pillar had received two recognition awards, which speak to the team's continued dedicated service and great performance. For the third year in a row, the Corporation's O&M contract with the City of Canton, GA, was honored with the **Gold Award by the Georgia Association of Water Professionals (GAWP)**. This award recognizes exceptional performance in the delivery of safe drinking water and the protection of Georgia's water resources, as this type of leadership is essential to a prosperous future for all Georgians. Furthermore, the O&M contract with the Town of Warren, RI, has received an award from the Rhode Island Clean Water Association (RICWA) for the second year in a row. The Corporation's facility was awarded the **2022 Platinum Award for Complete Permit Compliance**.

- On May 16, 2023, $H_2O$ Innovation announced that it had recently been awarded three new O&M service contracts and had extended seven existing contracts. These specific projects have a total value of $5.4 M.

## CORPORATE HIGHLIGHTS

- On December 6, 2022, $H_2O$ Innovation collaborated with the National Bank of Canada to develop a sustainable financing solution to fund the Corporation's continued growth in water technology manufacturing and services by qualifying its revolving credit facility as the first Blue Loan of $65.0 M.

- On December 6, 2022, $H_2O$ Innovation held its Annual General Meeting of Shareholders and upper management took the opportunity to provide shareholders with an update on the Three-Year Strategic Plan. The shareholders elected or re-elected the following directors to the Corporation's Board of Directors: Lisa Henthorne, Chairwoman of the Board of Directors, Frédéric Dugré, President and Chief Executive Officer of $H_2O$ Innovation, Pierre Côté, Stéphane Guérin, Richard Hoel, Bertrand Lauzon, Caroline Lemoine and Elisa M. Speranza.

- On February 15, 2023, $H_2O$ Innovation announced the appointment of Mr. Leonard F. Graziano as a member of its Board of Directors, effective on February 13, 2023. Mr. Graziano has been serving on $H_2O$ Innovation's Strategy, Innovation and Large Projects Committee (the "Strategy Committee") as an external advisor for the last six years.

- $H_2O$ Innovation was pleased to launch its mobile fleet of water and wastewater treatment systems. This new service offering will require capital expenditure ("CAPEX") investment, which was made possible by the recent agreement with National Bank of Canada on June 30, 2023. This agreement led to a $10.0 M increase in the Corporation's Blue Loan credit facility, which now stands at $75.0 M. This strategic initiative should enable $H_2O$ Innovation to broaden its range of services, strengthen its customer relationships through the sale of consumables required to operate the fleet assets, and thus improve its profit margins.

# MANAGEMENT'S DISCUSSION AND ANALYSIS

For the year ended
June 30, 2023

For additional information:
Investor Relations
*investor@h2oinnovation.com*

Trading symbols:
TSX: HEO
Growth Paris: MNEMO: ALHEO
OTCQX: HEOFF

Financial reports, annual reports and press releases are accessible on our website *www.h2oinnovation.com* and on SEDAR+.

## MANAGEMENT'S DISCUSSION AND ANALYSIS

Management's discussion and analysis ("MD&A") is designed to provide the reader with a greater understanding of the Corporation's business and financial performance, as well as how it manages risks and resources. In accordance with National Instrument 51-102 *Continuous Disclosure Obligations*, the following comments are intended to provide a review and an analysis of $H_2O$ Innovation's operating results and financial position for the year and the quarterly period ended June 30, 2023, in comparison with the corresponding period ended June 30, 2022. This MD&A should be read in conjunction with the audited consolidated financial statements and the accompanying notes for the year ended June 30,2023.

In this MD&A, "$H_2O$ Innovation," the "Corporation," or the words "we," "our," and "us" refer to either $H_2O$ Innovation Inc. as a group or to each of the business pillar, depending on the context.

Unless otherwise indicated, all financial information in the present report is expressed in Canadian dollars and come from the audited consolidated financial statements prepared in accordance with International Financial Reporting Standards ("IFRS").

Additional information about $H_2O$ Innovation, including our 2023 Annual Information Form, is available on our website at www.h2oinnovation.com and on the SEDAR+ website at www.sedarplus.ca.

## FORWARD-LOOKING STATEMENTS

The Corporation's oral and written public communications may include forward-looking statements. These statements are included in this report and may be included in other fillings or communications from the Corporation. The forward-looking statements are made pursuant to the applicable securities legislation. Forward-looking statements may involve, but are not limited to, statements and comments with respect to the Corporation's business, activities, predictions, projections, financial objectives, forecasts, targets, expectations for financial condition or outlook for operations. Forward-looking information also relates to, among other things, the Corporation's strategies to achieve its objectives, as well as information with respect to management's beliefs, plans, expectations, anticipations, estimations, and intentions, and may also include other statements that are predictive in nature, or that depend upon or refer to future events or conditions. The management of $H_2O$ Innovation would like to point out that forward-looking statements involve a number of uncertainties, known and unknown risks and other factors which may cause the actual results, performance or achievements of the Corporation, or of its industry, to materially differ from any future results, performance or achievements expressed or implied by such forward-looking statements. In preparing its outlook, the Corporation made assumptions that do not consider extraordinary events or circumstances beyond its control. When used in this report, words such as "aim," "anticipate," "assume," "believe," "continue," "could," "estimate," "expect," "forecast," "foresee," "future," "goal," "guidance," "indicate," "intend," "likely," "maintain," "may," "objective," "outlook," "plan," "potential," "predict," "project," "seek," "should," "strategy," "synergies," "target," "undertake," "view," "vision," "will," "would" or the negative or comparable terminology as well as terms usually used in the future and the conditional are generally intended to identify forward-looking statements, although not all forward-looking statements include such words.

The information contained in forward-looking statements is based upon certain material assumptions that were applied in drawing a conclusion or making expectations, forecasts, projections, predictions, or estimations, including management's perceptions of historical trends, current conditions and expected future developments, as well as other considerations that are believed to be appropriate in the circumstances. A change affecting an assumption can also have an impact on other interrelated assumptions, which could increase or diminish the effect of the change. Forward-looking statements are presented for the purpose of assisting investors and others in understanding certain key elements of the Corporation's current objectives, strategic priorities, expectations and plans, and in obtaining a better understanding of the Corporation's business and anticipated operating environment. Readers are cautioned that some of the forward-looking statements in this report, such as statements concerning sales growth, growth ratio or level, recurring revenues, backlog level, synergies and cross-selling opportunities, capital expenditures, inventory levels and expenses associated with the Corporation's Three-Year Strategic Plan, may be considered as financial outlooks for the purposes of the applicable securities legislation. These financial outlooks are presented to evaluate potential future earnings and

anticipated future use of cash flow and may not be appropriate for other purposes. Readers should not assume these financial outlooks will be achieved.

Forward-looking statements contained in this report include, but are not limited to, statements regarding future capital expenditures, revenues, expenses, earnings, economic performance, indebtedness and financial position; business and management strategies; expansion and growth of the Corporation's operations; the Corporation's backlog, the execution of said backlog and the timing of new and existing projects and contracts; the Corporation's ability to deliver projects and contracts in due time, without additional costs, considering labor shortage and the global impact on the supply chain; the Corporation's ability to generate future cash flows; the Corporation's ability to capitalize on future growth opportunities; anticipated trends in the Corporation's revenue streams and business mix; expectations of customers' needs; customers' acceptance of and confidence in the Corporation's existing technologies and product innovation; and other expectations, beliefs, plans, goals, objectives, assumptions, information and statements about possible future events, conditions and results. Several factors, risks or uncertainties could cause the actual results to differ materially from the results discussed in the forward-looking statements. Should one or more of these factors, risks or uncertainties materialize or should the assumptions underlying those forward-looking statements prove incorrect, actual results may vary materially from those described herein. Such factors include, without limitation: (a) recruitment, retention and management of quality employees and key personnel; (b) IT network and cybersecurity; (c) health and safety; (d) regulatory and environmental compliance; (e) quality control; (f) manufacturing capabilities; (g) contract revenues; (h) supply chain; (i) climate change and unpredictable weather conditions; (j) competitive environment; (j) litigation; (l) acquisition and integration; (m) international operations and geopolitical climate; (n) current global financial conditions; (o) development of new products; (p) liquidity; (q) interest rates and inflation; (r) implementation and achievement of the Strategic Plan; (s) indebtedness; (t) compliance with anti-corruption and anti-bribery laws; (u) stock liquidity; (v) insurance coverage; (w) credit; (x) foreign exchange; (y) impairment of intangible assets; (z) transfer pricing; (aa) confidentiality breach; (bb) public health, (cc) capacity to secure performance guarantees, and (dd) additional equity financing and dilution. The Corporation cautions that the foregoing list of factors is not exhaustive. Additional information about the risk factors to which the Corporation is exposed to is provided in the Annual Information Form dated September 27, 2023, which is available on SEDAR+ (www.sedarplus.ca).

The forward-looking statements set forth therein reflect the Corporation's expectations as of June 30, 2023, and are subject to change after this date. The Corporation may, from time to time, make oral forward-looking statements. The Corporation advises that the above paragraphs and the risk factors described herein should be read for a description of certain factors that could cause the actual results of the Corporation to differ materially from those in the oral forward-looking statements. Unless required to do so pursuant to applicable securities legislation, $H_2O$ Innovation assumes no obligation to update or revise forward-looking statements contained in this report or in other communications as a result of new information, future events, and other changes.

**NON-IFRS MEASURES AND RATIOS AND SUPPLEMENTAL FINANCIAL MEASURES**

Certain indicators used by the Corporation to analyze and evaluate its results, which are listed below, are non-IFRS financial measures or ratios, supplementary financial measures or non-financial information. Consequently, they do not have a standardized meaning as prescribed by IFRS and therefore may not be comparable to similar measures presented by other issuers. These non-IFRS measures are presented as additional information and should be used in conjunction with the IFRS financial measurements presented in this report. Even though these measures are non-IFRS measures, they are used by management to make operational and strategic decisions. Providing this information to the stakeholders, in addition to the Generally Accepted Accounting Principles ("GAAP") measures, allows them to see the Corporation's results through the eyes of management and to better understand the financial performance, notwithstanding the impact of GAAP measures. However, these measures should not be viewed as a substitute for related financial information prepared in accordance with IFRS. The following non-IFRS indicators are used by management to measure the performance and liquidity of the Corporation:

- Earnings before interests, income taxes, depreciation and amortization ("EBITDA")
- Adjusted earnings before interests, income taxes, depreciation and amortization ("Adjusted EBITDA")
- Adjusted EBITDA over revenues
- Earnings before administrative costs and other items listed in note 25 of the consolidated financial statements ("EBAC")
- EBAC over revenues
- Adjusted net earnings (loss)
- Adjusted net earnings (loss) per share ("Adjusted EPS")
- Net debt including and excluding contingent considerations
- Net debt-to-Adjusted EBITDA ratio
- Recurring revenues by nature
- Organic revenue
- Organic revenue growth
- Acquisition revenue growth
- O&M contracts renewal rate
- Backlog

Definition of all non-IFRS measures and ratios and supplemental financial measures are provided in section "Non-IFRS financial measurements" on page 32 to give the reader a better understanding of the indicators used by management. In addition, when applicable, the Corporation presents a quantitative reconciliation of the non-IFRS measure to the most directly comparable measure calculated in accordance with IFRS. Refer to Section "Non-IFRS financial measurements" on page 32 of this MD&A for detailed presentation and reconciliation of non-IFRS measures used.

## KEY FINANCIAL HIGHLIGHTS [1]

For the year ended June 30, 2023
Compared with the year ended June 30, 2022

| Revenues | Recurring revenues [3][4] | Organic growth [3][4] (%) | Consolidated backlog |
|---|---|---|---|
| **$253.3 M** | **88.5%** | **20.1%** | **$189.6 M** |
| ↑ $68.9 M or 37.4% | ↑ from 84.9% | ↑ from 17.7% | ↑ 16.3% from $163.0 M |

| Gross profit margin [1][4] | SG&A [2][4] | Adjusted EBITDA [3] | Adjusted EBITDA [3][4] (%) |
|---|---|---|---|
| **25.2%** | **17.5%** | **$21.4 M** | **8.4%** |
| ↓ from 26.9% | ↓ from 18.1% | ↑ 18.2% from $18.1 M | ↓ from 9.8% |

| Net earnings (loss) | Adjusted net earnings [3] | Cash flow from (used in) operating activities | Net debt including contingent considerations [3] |
|---|---|---|---|
| **($1.3 M)** **Or (0.014) per share [5]** | **$7.8 M** **Or 0.087 per share [3][5]** | **$28.9 M** | **$39.9 M** |
| ↓ from $5.1 M or (0.058) per share | ↓ from $8.8 M | ↑ from ($6.3 M) | ↓ from $50.3 M |

(1) Gross profit margin presented before depreciation and amortization expenses.
(2) Selling, general operating and administrative expenses (SG&A).
(3) These are non-IFRS financial measures defined below and accompanied by a reconciliation to the most directly comparable IFRS financial measure. Refer to the "Non-IFRS financial measurements" section on page 32.
(4) % of total consolidated revenues.
(5) Calculated using the basic weighted average number of shares outstanding.

[1] In thousands of Canadian dollars except per share amounts.

## SELECTED CONSOLIDATED FINANCIAL INFORMATION

(In thousands of Canadian dollars except per share amounts)

| **Income Statements and Cash flows** | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | | 2022 | | **2023** | | 2022 | |
| | **$** | **% (1)** | $ | % (1) | **$** | **% (1)** | $ | % (1) |
| **Revenues per business pillar** | | | | | | | | |
| WTS | **15,057** | **23.2** | 12,997 | 25.0 | **50,138** | **19.8** | 42,440 | 23.0 |
| Specialty products | **18,987** | **29.2** | 13,360 | 25.7 | **85,527** | **33.8** | 54,397 | 29.5 |
| O&M | **30,916** | **47.6** | 25,689 | 49.4 | **117,654** | **46.4** | 87,519 | 47.5 |
| Total revenues | **64,960** | **100.0** | 52,046 | 100.0 | **253,319** | **100.0** | 184,356 | 100.0 |
| **Revenues per geographic location** | | | | | | | | |
| Canada | **4,949** | **7.6** | 5,181 | 10.0 | **22,186** | **8.8** | 21,533 | 11.7 |
| United States | **43,893** | **67.6** | 36,809 | 70.7 | **178,876** | **70.6** | 127,616 | 69.2 |
| Others | **16,118** | **24.8** | 10,056 | 19.3 | **52,257** | **20.6** | 35,207 | 19.1 |
| Total revenues | **64,960** | **100.0** | 52,046 | 100.0 | **253,319** | **100.0** | 184,356 | 100.0 |
| Recurring revenues (2) | **57,272** | **88.2** | 43,543 | 83.7 | **224,278** | **88.5** | 156,511 | 84.9 |
| Gross profit margin (3) | **15,287** | **23.5** | 13,464 | 25.9 | **63,755** | **25.2** | 49,607 | 26.9 |
| Selling, general and administrative expenses ("SG&A") | **12,511** | **19.3** | 9,667 | 18.6 | **44,211** | **17.5** | 33,376 | 18.1 |
| Other (gains) and losses – net | **445** | **0.7** | 1,621 | 3.1 | **913** | **0.4** | 2,517 | 1.4 |
| Finance costs – net | **1,563** | **2.4** | 753 | 1.4 | **5,749** | **2.3** | 2,359 | 1.3 |
| Net earnings (loss) for the period | **(2,289)** | **(3.5)** | 2,445 | 4.7 | **(1,296)** | **(0.5)** | 5,107 | 2.8 |
| Net earnings (loss) per share ("EPS"): | | | | | | | | |
| Basic EPS | **(0.025)** | **-** | 0.028 | - | **(0.014)** | **-** | 0.058 | - |
| Diluted EPS | **(0.025)** | **-** | 0.027 | - | **(0.014)** | **-** | 0.054 | - |
| EBITDA (2) | **1,999** | **3.1** | 1,999 | 3.8 | **17,445** | **6.9** | 13,079 | 7.1 |
| Adjusted EBITDA (2) | **3,126** | **4.8** | 4,754 | 9.1 | **21,404** | **8.4** | 18,101 | 9.8 |
| Adjusted net earnings (loss) (2) | **(176)** | **(0.3)** | 1,627 | 3.1 | **7,796** | **3.1** | 8,848 | 4.8 |
| Adjusted EPS (2): | | | | | | | | |
| Adjusted basic EPS (2) | **(0.002)** | **-** | 0.018 | - | **0.087** | **-** | 0.100 | - |
| Adjusted diluted EPS (2) | **(0.002)** | **-** | 0.018 | - | **0.083** | **-** | 0.094 | - |
| Cash flows from (used in) operating activities | **14,482** | **22.3** | (6,390) | (12.3) | **28,862** | **11.4** | (6,250) | (3.4) |

| **Financial position** | **June 30, 2023** | June 30, 2022 | Variation | |
|---|---|---|---|---|
| | **$** | $ | $ | % |
| Cash | **17,071** | 7,382 | 9,689 | 131.3 |
| Inventories | **20,459** | 20,171 | 288 | 1.4 |
| Contract assets | **11,087** | 11,591 | (504) | (4.3) |
| Net debt excluding contingent considerations (2) | **34,745** | 40,253 | (5,508) | (13.7) |
| Net debt-to-Adjusted EBITDA ratio (2) | **1.62** | 2.23 | - | - |
| Consolidated backlog | **189,596** | 163,036 | 26,560 | 16.3 |

(1) % of total revenues.
(2) Refer to the "Non-IFRS financial measurements" section on page 32 for detailed information about the non-IFRS measures used in this MD&A.
(3) Gross profit margin presented before depreciation and amortization.

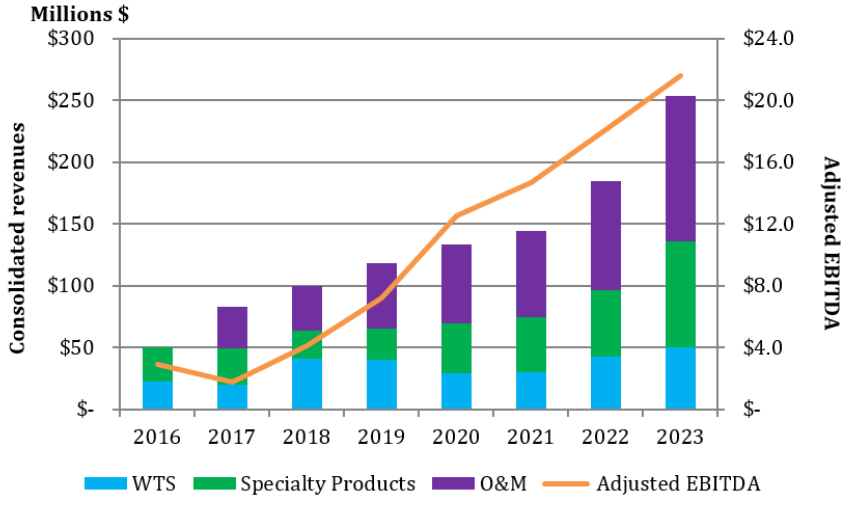
## QUARTERLY FINANCIAL INFORMATION

| (In thousands of Canadian dollars, except for per share values) | Three-month periods ended | | | | Year ended |
|---|---|---|---|---|---|
| | June 30, 2023 | March 31, 2023 | December 31, 2022 | September 30, 2022 | June 30, 2023 |
| | **$** | **$** | **$** | $ | **$** |
| Revenues | **64,960** | 68,360 | 63,850 | 56,149 | 253,319 |
| EBITDA [2] | **1,999** | 5,626 | 5,408 | 4,412 | 17,445 |
| Adjusted EBITDA [2] | **3,126** | 6,857 | 6,453 | 4,968 | 21,404 |
| Adjusted EBITDA over revenues [2] | **4.8%** | 10.0% | 10.1% | 8.8% | 8.4% |
| Net earnings (loss) | **(2,289)** | 364 | 620 | 9 | (1,296) |
| Basic EPS [1] | **(0.025)** | 0.004 | 0.007 | 0.000 | (0.014) |
| Diluted EPS [1] | **(0.025)** | 0.004 | 0.011 | 0.000 | (0.014) |
| Adjusted net earnings (loss) [2] | **(176)** | 2,670 | 2,712 | 2,590 | 7,796 |
| Adjusted basic EPS [1] [2] | **(0.002)** | 0.030 | 0.030 | 0.029 | 0.087 |
| Adjusted diluted EPS [1] [2] | **(0.002)** | 0.028 | 0.029 | 0.028 | 0.083 |
| Cash flows from (used in) operating activities | **14,482** | 10,359 | 6,570 | (2,549) | 28,862 |

| (In thousands of Canadian dollars, except for per share values) | Three-month periods ended | | | | Year ended |
|---|---|---|---|---|---|
| | June 30, 2022 | March 31, 2022 | December 31, 2021 | September 30, 2021 | June 30, 2022 |
| | $ | $ | $ | $ | **$** |
| Revenues | 52,046 | 51,917 | 42,009 | 38,384 | 184,356 |
| EBITDA [2] | 1,999 | 4,382 | 3,423 | 3,275 | 13,079 |
| Adjusted EBITDA [2] | 4,754 | 5,530 | 3,799 | 4,018 | 18,101 |
| Adjusted EBITDA over revenues [2] | 9.1% | 10.7% | 9.0% | 10.5% | 9.8% |
| Net earnings | 2,445 | 1,282 | 762 | 618 | 5,107 |
| Basic EPS [1] | 0.028 | 0.015 | 0.009 | 0.007 | 0.058 |
| Diluted EPS [1] | 0.027 | 0.014 | 0.008 | 0.007 | 0.054 |
| Adjusted net earnings [2] | 1,627 | 3,330 | 1,759 | 2,132 | 8,848 |
| Adjusted basic EPS [1] [2] | 0.018 | 0.038 | 0.020 | 0.025 | 0.100 |
| Adjusted diluted EPS [1] [2] | 0.018 | 0.037 | 0.019 | 0.023 | 0.094 |
| Cash flows from (used in) operating activities | (6,390) | 4,976 | (3,343) | (1,493) | (6,250) |

[1] Quarterly EPS are not additive and may not equal the annual EPS reported. This may be a result of the effect of shares issued on the weighted average number of shares, as well as the impact of dilutive options and warrants.

[2] Refer to the "Non-IFRS financial measurements" section on page 32 for detailed information about the non-IFRS measures used in this MD&A.



**LAST TWELVE MONTHS**

| (In thousands of Canadian dollars, except for per share values) | **Year ended June 30, 2023** | Year ended June 30, 2022 | Variation | |
|---|---|---|---|---|
| | **$** | $ | $ | % |
| Revenues | **253,319** | 184,356 | 68,963 | 37.4 |
| EBITDA [1] | **17,445** | 13,079 | 4,366 | 33.4 |
| Adjusted EBITDA [1] | **21,404** | 18,101 | 3,303 | 18.2 |
| Adjusted EBITDA over revenues [1] | **8.4%** | 9.8% | - | - |
| Net earnings (loss) | **(1,296)** | 5,107 | (6,403) | (125.4) |
| Basic EPS | **(0.014)** | 0.058 | (0.072) | (124.2) |
| Diluted EPS | **(0.014)** | 0.054 | (0.068) | (125.9) |
| Adjusted net earnings [1] | **7,796** | 8,848 | (1,052) | (11.9) |
| Adjusted basic EPS [1] | **0.087** | 0.100 | (0.013) | (13.0) |
| Adjusted diluted EPS [1] | **0.083** | 0.094 | (0.011) | (11.7) |
| Cash flows from operating activities | **28,862** | (6,250) | 35,112 | (561.8) |

[1] Refer to the "Non-IFRS financial measurements" section on page 32 for detailed information about the non-IFRS measures used in this MD&A.

Revenues for the last twelve months increased by 37.4% compared to the corresponding period, demonstrating a sustained growth momentum across all business lines of the Corporation from organic and acquisition growth, combined with foreign exchange rates variations.

| **Revenues Growth** (In thousands of Canadian dollars) | **Year ended June 30, 2023** | | Year ended June 30, 2022 | |
|---|---|---|---|---|
| | **$** | **%** | $ | % |
| Organic growth [1] | **37,078** | **20.1** | 25,595 | 17.7 |
| Acquisition growth [1] | **24,307** | **13.2** | 15,762 | 10.9 |
| Impact of foreign exchange rates | **7,578** | **4.1** | (1,325) | (0.9) |
| Net variation | **68,963** | **37.4** | 40,032 | 27.7 |

[1] Refer to the "Non-IFRS financial measurements" section on page 32 for detailed information about the non-IFRS measures used in this MD&A.

The efforts made over the last twelve months to focus on organic revenue growth led to an increase from 17.7% to 20.1% year over year. We believe that the increased demand for water treatment solutions, and the continued adoption of our specialty products have led to higher revenue contribution from new customers and scope expansions with our existing base of customers. We also invested in various growth initiatives, such as hiring strategic sales resources and investing in SG&A to stay aligned with the objectives of our Three-Year Strategic Plan. Those investments have been successful since the objective of 10.0% organic revenue growth of our Three-Year Strategic Plan has been largely exceeded.

The adjusted EBITDA increased to $21.4 M, from $18.1 M in the last twelve-month period, representing an increase of $3.3 M or 18.2%. The adjusted EBITDA over revenues is lower at 8.4% compared to 9.8% last year, representing a reduction of the ratio by 1.4 %, explained by a decrease of the gross profit margin and the business mix. The global overheated economy has affected the Corporation's gross profit margin considering the supply chain challenges, the increased costs of materials as well as the pressure on employee salaries due to the labour shortage and inflation. In addition, the maple industry faced the worst harvest season in five years in Canada and the US due to unseasonable weather conditions.

However, one of $H_2O$ Innovation's strengths is its ability to rely on different sources of revenue coming from its three business pillars and on a high level of recurring revenues, which reduces the risk of volatility on the EBITDA. The growing demand for our proprietary specialty products, the construction of new water infrastructure to face water scarcity, industrial companies pushing ESG initiatives to reduce their water footprint, and ongoing challenges for municipalities to deal with growing populations and aging utilities have allowed our business pillars to capture multiple sales synergies and to experience significant revenue growth over the last-twelve-month period.

**CONSOLIDATED REVENUES**

| (In thousands of Canadian dollars) | three-month periods ended June 30, | | | | Foreign exchange impact | | Acquisitions revenue growth | | Organic revenue growth | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | | | | | | |
| **Revenues per business pillar** | **$** | $ | $ | % | $ | %(1) | $ | %(1) | $ | %(1) |
| WTS | **15,057** | 12,997 | 2,060 | 15.8 | 582 | 1.1 | - | - | 1,478 | 2.8 |
| Specialty products | **18,987** | 13,360 | 5,627 | 42.1 | 726 | 1.4 | 1,696 | 3.3 | 3,205 | 6.2 |
| O&M | **30,916** | 25,689 | 5,227 | 20.3 | 1,505 | 2.9 | - | - | 3,722 | 7.2 |
| Total revenues | **64,960** | 52,046 | 12,914 | 24.8 | 2,813 | 5.4 | 1,696 | 3.3 | 8,405 | 16.1 |

(1) Percentage over total revenues.

With three strong and complementary business pillars, the Corporation is well balanced and not dependent on a single source of revenue, enabling it to generate a sustained revenue growth. Consolidated revenues coming from our three business pillars, for the three-month period ended June 30, 2023, increased by $12.9 M, or 24.8%, to reach $65.0 M compared to $52.0 M in the corresponding period of the previous year. This increase mainly came from an organic revenue growth of $8.4 M, or 16.1%, and an acquisition growth of $1.7 M, or 3.3% following the acquisitions of Leader on June 30, 2022, combined with a favorable exchange rate impact of $2.8 M, or 5.4%.

Revenues from the WTS business pillar increased by $2.1 M, or 15.8% compared to the same quarter of the previous year, coming mainly from higher organic revenue in water treatment systems projects and an increase of our sales coming from the service group. The Corporation's Three-Year Strategic Plan consists of prioritizing WTS projects with higher gross profit margins that can fuel opportunities for the other business pillars, and to expand service activities which tend to be recurring in nature and at higher gross profit margin. Furthermore, our WTS team strives to develop relationships with industrial clients for whom water reuse solutions could alleviate operational concerns emerging from water scarcity and water tariff increases. This is becoming a growing trend as many industrial companies are now taking steps to become net water positive in their manufacturing processes by recycling a maximal volume of wastewater, thus becoming more independent for their supply of water and also align with their respective ESG plans.

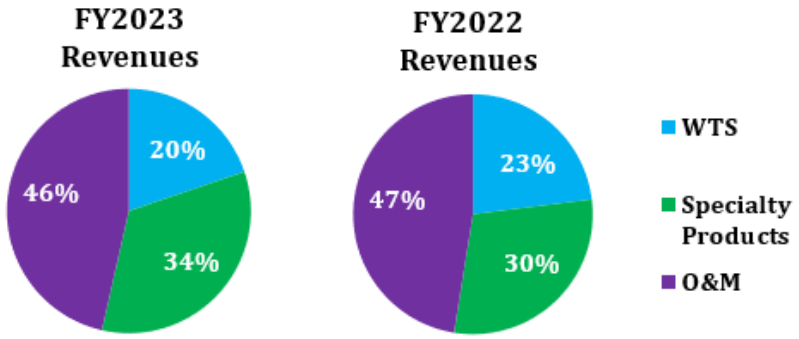
Revenues from the Specialty Products business pillar increased by $5.6 M, or 42.1%, compared to the same quarter of the previous year. These results were driven by the acquisition of Leader which contributed to an acquisition growth of $1.7 M, or 3.3% and by an organic revenue growth of $3.2 M, or 6.2%, weighted average over total revenues. The Specialty Chemicals Group and Piedmont business lines contributed to this strong growth since investments in product innovation, manufacturing capabilities expansion and synergies captured from the integration of past acquisitions fueled this performance. Meanwhile, even though the Maple business line experienced the toughest maple syrup season in many years, the impact of the Leader acquisition still creates a growth effect on revenues.

Revenues from the O&M business pillar increased by $5.2 M, or 20.3%, compared to the same quarter of the previous year. Organic growth accounted for $3.7 M, or 7.2%, weighted average over total revenues this quarter, combined with a favorable USD exchange rate impact of $1.5 M. Most of the long-term contracts expiring during the period were successfully renewed with entitled fee increase based on Consumer Price Index (CPI), which secures upcoming recurring revenues.

Our business model allows us to gain predictability and, through our integrated offering, from systems design and manufacturing to O&M and Specialty Products, we maintain long-term relationships with our customers. For the three-month period ended June 30, 2023, recurring revenues[1] represented 88.2% of the Corporation's total revenues, compared to 83.7% for the comparable quarter of the previous year. The WTS business pillar builds long-term relationships with its customers through aftersales services, Specialty Products and O&M services offering, which supports the decision to invest in the business development and growth of these business pillars. The Corporation's business pillars feed each other by allowing for cross-selling of products and services to better serve our customers.

[1] Refer to the"Non-IFRS financial measurements" section on page 32 for detailed information about the non-IFRS measures used in this MD&A.

By promoting strong customer retention across all business pillars, our business model has demonstrated resiliency throughout the pandemic and even during high volatility economical periods.




**GROSS PROFIT MARGIN BEFORE DEPRECIATION AND AMORTIZATION**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Gross profit margin [1] | **15,287** | 13,464 | 1,823 | 13.5 | **63,755** | 49,607 | 14,148 | 28.5 |
| Gross profit margin (%) [1] | **23.5%** | 25.9% | - | - | **25.2%** | 26.9% | - | - |

(1) Gross profit margin presented before depreciation and amortization.

The Corporation's gross profit margin before depreciation and amortization stood at $15.3 M, or 23.5%, during the fourth quarter of fiscal year 2023, compared to $13.5 M, or 25.9% for the same period of the previous fiscal year, representing an increase of $1.8 M, or 13.5%, while the revenues of the Corporation increased by 24.8%. For the year ended June 30, 2023, the gross profit margin before depreciation and amortization stood at $63.8 M, or 25.2% compared to $49.6 M, or 26.9% for the same period last year, representing an increase of $14.2 M, or 28.5%, while the revenues of the Corporation increased by 37.4%. The decrease in percentage for the three-month period and the year ended June 30, 2023, is explained by high inflation of material costs, pressure on salaries, business mix within the Specialty Products business pillar combined with the most difficult maple season in many years due to unseasonable weather conditions.

**SELLING, GENERAL AND ADMINISTRATIVE EXPENSES ("SG&A")**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| SG&A expenses | **12,511** | 9,667 | 2,844 | 29.4 | **44,211** | 33,376 | 10,835 | 32.5 |
| SG&A expenses over revenues | **19.3%** | 18.6% | - | - | **17.5%** | 18.1% | - | - |

The Corporation's SG&A reached $12.5 M during the fourth quarter of fiscal year 2023, compared to $9.7 M for the same period of the previous year, representing an increase of $2.8 M, or 29.4%, while the revenues of the Corporation increased by 24.8%. For the year ended June 30, 2023, SG&A reached $44.2 M, compared to $33.4 M for the same period last year, representing an increase of $10.8 M, or 32.5%, while the revenues of the Corporation increased by 37.4%. Those increases are explained by the pressure on salaries, the hiring of additional resources as well as higher stock-based compensation costs. Despite the increase in SG&A expenses, the percentage of expenses over revenues for the three-month period slightly increased by 0.7% while the twelve-month period decreased by 0.6%, showing the scalability of our business model as revenues continue to grow. Investments made in sales and business development are paying off since revenues are growing faster than the SG&A ratio.

**FINANCE COSTS – NET**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Finance income | **(13)** | (7) | (6) | 85.7 | **(40)** | (33) | (7) | 21.2 |
| Finance costs | **1,576** | 760 | 816 | 107.4 | **5,789** | 2,392 | 3,397 | 142.0 |
| Finance costs - net | **1,563** | 753 | 810 | 107.6 | **5,749** | 2,359 | 3,390 | 143.7 |

Finance costs – net for the three- and twelve-month periods ended June 30, 2023, increased by $0.8 M and $3.3 M respectively, compared with the same period last year. The variations are explained by the utilization of our credit facility for the integration of past acquisitions and investments into growth and maintenance CAPEX to support operations. In addition, the rise in interest rates also contributed to increasing our finance costs.

In order to mitigate its credit risk, the Corporation insures a portion of its accounts receivable through EDC insurance coverage, under which the Corporation has given direction to pay all insurance proceeds to the bank.

**OTHER (GAINS) AND LOSSES – NET**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Other (gains) and losses - net | **445** | 1,621 | (1,176) | (72.5) | **913** | 2,517 | (1,604) | (63.7) |

Other (gains) and losses – net stood at $0.4 M for the fourth quarter of fiscal year 2023, compared with $1.6 M for the same period last year, representing a decrease of $1.2 M. The decrease was primarily driven by lower unrealized exchange loss and lower revaluation of the fair value of contingent considerations.

Other (gains) and losses – net stood at $0.9 M for the year ended June 30, 2023, compared with $2.5 M for the same period last year, representing a decrease of $1.6 M. The variation was primarily driven by a gain on a debt extinguishment which was assumed as part of the acquisition of Leader as at June 30, 2022, and fully extinguished during the first quarter of fiscal year 2023, and by lower revaluation of the fair value of contingent considerations, partly compensated by higher unrealized exchange loss.

**ADJUSTED EBITDA**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| EBITDA[1] | **1,999** | 1,999 | - | - | **17,445** | 13,079 | 4,366 | 33.4 |
| Adjusted EBITDA[1] | **3,126** | 4,754 | (1,628) | (34.2) | **21,404** | 18,101 | 3,303 | 18.2 |
| Adjusted EBITDA (%)[1] | **4.8%** | 9.1% | - | - | **8.4%** | 9.8% | - | - |

The Corporation's adjusted EBITDA decreased by $1.7 M or 34.2%, to reach $3.1 M during the fourth quarter of fiscal year 2023, from $4.8 M for the same period last year. The adjusted EBITDA % decreased by 4.3% to stand at 4.8% for the fourth quarter of fiscal year 2023, compared to 9.1% for the same period last year.

The Corporation's adjusted EBITDA increased by $3.3 M, or 18.2%, to reach $21.4 M for the year ended June 30, 2023, from $18.1 M for the same period last year, while the revenues of the Corporation increased by 37.4%. Consequently, the adjusted EBITDA % decreased by 1.4% and reached 8.4% for the year ended June 30, 2023, compared to 9.8% for the same period last year. Those variations are mostly explained by a decrease in the Corporation's consolidated gross profit margin, considering that the Corporation's profitability has been impacted by ongoing macroeconomic trends on the supply chain, higher inflation, increased wages and toughest maple season in a decade.

**NET EARNINGS (LOSS)**

| (In thousands of Canadian dollars except per share amounts) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Net earnings (loss) | **(2,289)** | 2,445 | (4,734) | (193.6) | **(1,296)** | 5,107 | (6,403) | (125.4) |
| Basic net earnings (loss) per share | **(0.025)** | 0.028 | (0.053) | - | **(0.014)** | 0.058 | (0.072) | - |
| Diluted net earnings (loss) per share | **(0.025)** | 0.027 | (0.052) | - | **(0.014)** | 0.054 | (0.068) | - |
| Adjusted net earnings (loss)[1] | **(176)** | 1,627 | (1,803) | (110.8) | **7,796** | 8,848 | (1,052) | (11.9) |
| Basic adjusted net earnings (loss) per share[1] | **(0.002)** | 0.018 | (0.020) | - | **0.087** | 0.100 | (0.013) | - |
| Diluted adjusted net earnings (loss) per share[1] | **(0.002)** | 0.018 | (0.020) | - | **0.083** | 0.094 | (0.011) | - |

Net loss amounted to ($2.3 M) or ($0.025) per share for the fourth quarter of fiscal year 2023 compared to net earnings of $2.4 M or $0.028 per share for the same period last year. For the year ended June 30, 2023, net loss amounted to ($1.3 M) and ($0.014) per share compared to net earnings of $5.1 M and $0.058 per share for the same period last year. Those variations are explained by the reduction in gross profit margins, higher depreciation and amortization, higher finance costs, and higher tax expense, partially offset by other gains related to the debt extinguishment.

[1] Refer to the "Non-IFRS financial measurements" section on page 32 for detailed information about the non-IFRS measures used in this MD&A.

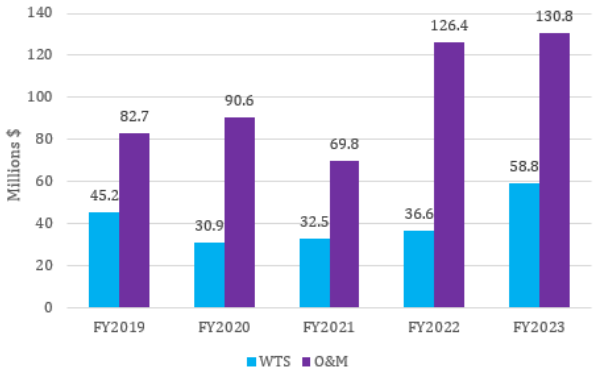
## BACKLOG

The backlog is defined as a forward-looking indicator of anticipated revenues to be recognized by the Corporation, determined based on contract awards that are firm and amounting to the transaction price allocated to remaining performance obligations ("RPO"). Management could be required to make estimates regarding the revenue to be generated for certain contracts.

As at June 30, 2023, the combined backlog of secured contracts between WTS and O&M reached $189.6 M compared to $163.0 M as at June 30, 2022. This combined backlog provides good visibility on revenues for the upcoming quarter of fiscal year 2024 and beyond.

| (In thousands of Canadian dollars) | As at June 30, | | | |
|---|---|---|---|---|
| | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % |
| WTS | **58,774** | 36,603 | 22,171 | 60.6 |
| O&M [1] | **130,822** | 126,433 | 4,389 | 3.5 |
| **Consolidated backlog** | **189,596** | 163,036 | 26,560 | 16.3 |

[1] The backlog coming from the O&M business pillar does not include O&M services provided to municipal utility districts (commonly know as MUD) and other privately owned utilities located in Texas, as well as the services provided to municipal and industrial customers in the State of New York, since these contracts are "evergreen" and would not qualify for the remaining performance obligation definition.




### WTS backlog

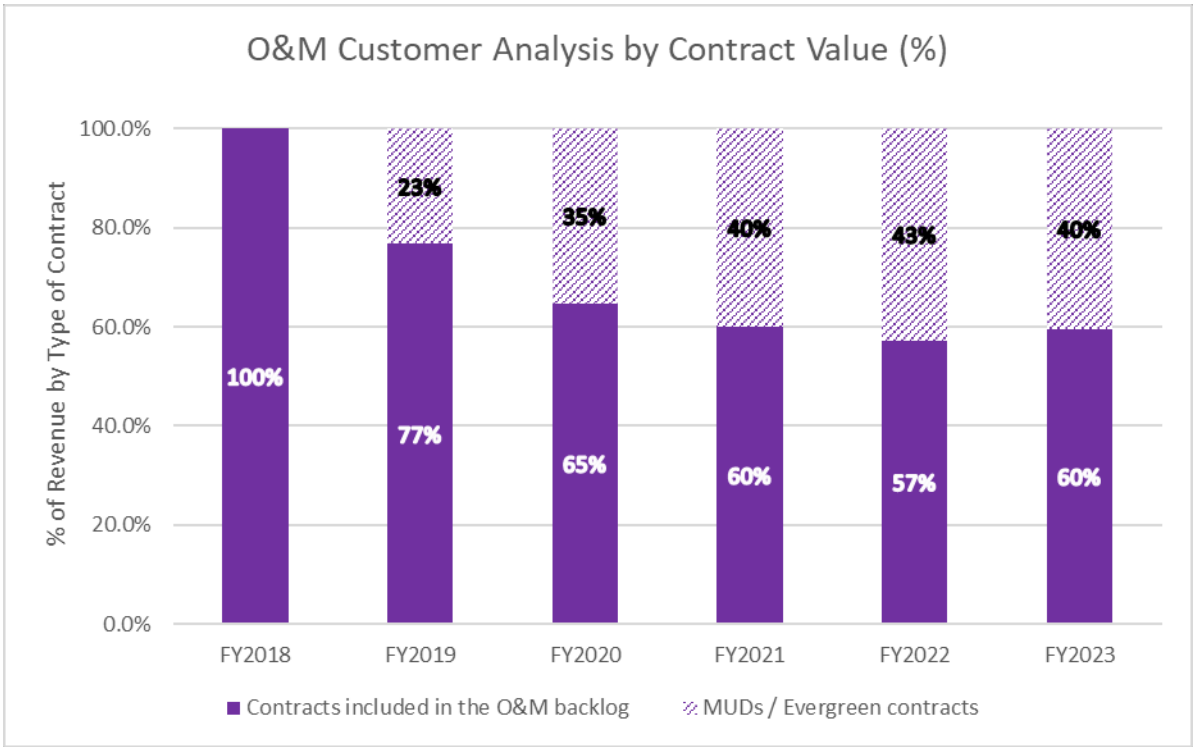
As at June 30, 2023, the WTS backlog stood at $58.8 M, which is an increase of 60.6% compared to the same period last year. This business pillar is showing a well-balanced backlog, with diversification seen between industrial and municipal projects: 36.7% of the projects being industrial as of June 30, 2023, compared to 32.0% as of June 30, 2022. Industrial projects are usually characterized by higher gross profit margins, shorter delivery cycle and revenue recognition, better potential of aftersales services, selling of consumables and specialty chemicals, while reducing the risks related to focusing on a single market.

### O&M backlog

Our backlog for the O&M business pillar stood at $130.8 M as at June 30, 2023, representing an increase of 3.5% compared to the $126.4 M backlog as at June 30, 2022, and consists of long-term contracts mainly with municipalities that include multi-year renewal options. The O&M backlog does not include O&M services provided to MUDs and other privately owned utilities located in Texas as well as the services provided to municipal and industrial customers located in the State of New York, since these contracts are "evergreen" and would not qualify for the remaining performance obligation definition.

The O&M business model should also be analyzed in % of customers retained. Both long-term customers included in the O&M backlog and those having "evergreen" contracts demonstrate how the Corporation has preserved customer relationships and can rely on recurring revenues. Past acquisitions in the State of Texas, combined with the acquisitions of JCO and EC in the State of New York, brought several "evergreen" O&M contracts that the Corporation was able to preserve. Furthermore, the Corporation's O&M sales team was able to secure additional contracts with new customers.

Long-term O&M contracts have a typical duration of three to five years and have different anniversary dates for renewal. An "evergreen" contract is a contract that automatically and indefinitely renews until one party gives to the other a notice to terminate. In the past, the Corporation has experienced a high contract renewal rate[1]. In fiscal year ended June 30, 2023, the Corporation renewed 91.8% (95.6%) of its existing O&M contracts and was awarded five new contracts. This year, a process of realigning the customer portfolio is underway to focus on most profitable clients with enhanced future opportunities, which is reflected in the renewal rate this year. Nevertheless, this initiative has been successful since the O&M business line generated a significant growth in terms of revenues.




[1] Refer to section "Non-IFRS" financial measurements" on page 32 for detailed information about non-IFRS measures used in this MD&A.

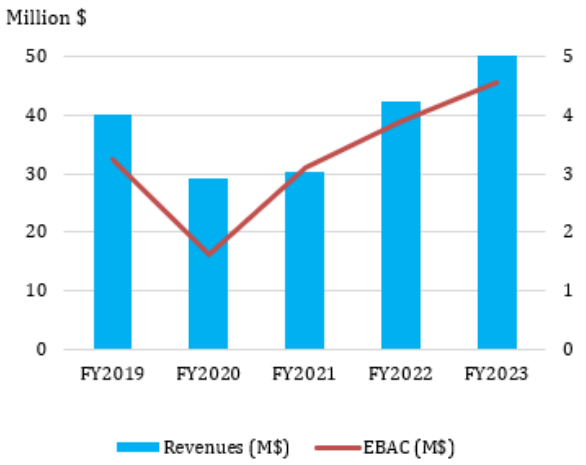
## SEGMENT INFORMATION

As mentioned in Section "$H_2O$ Innovation at a glance," management analyzes the Corporation's results by business pillar. The Corporation evaluates its business pillar performance using earnings before administrative costs and other items ("EBAC), which is a non-IFRS measure defined in the Section "Non-IFRS financial measurements" at page 32 of this MD&A. The following tables summarize the Corporation's revenues and EBAC per business pillar for the three-month period and year ended June 30, 2023, and 2022.

### WATER TECHNOLOGIES & SERVICES ("WTS")

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Revenues from WTS | **15,057** | 12,997 | 2,060 | 15.8 | **50,138** | 42,440 | 7,698 | 18.1 |
| *Organic growth* | | | *1,478* | *11.4* | | | *5,440* | *12.8* |
| *Acquisition growth* | | | - | - | | | - | - |
| *FX impact* | | | *582* | *4.5* | | | *2,258* | *5.3* |
| Cost of goods sold | **11,703** | 10,440 | 1,263 | 12.1 | **38,691** | 33,468 | 5,223 | 15.6 |
| Gross profit margin[1] | **3,354** | 2,557 | 797 | 31.2 | **11,447** | 8,972 | 2,475 | 27.6 |
| Gross profit margin (%)[1] | **22.3%** | 19.7% | - | - | **22.8%** | 21.1% | - | - |
| Selling and general expenses | **2,077** | 1,579 | 498 | 31.5 | **6,880** | 5,072 | 1,808 | 35.6 |
| EBAC[2] from WTS | **1,277** | 978 | 299 | 30.6 | **4,567** | 3,900 | 667 | 17.1 |
| EBAC[2] over revenues from WTS | **8.5%** | 7.5% | - | - | **9.1%** | 9.2% | - | - |

WTS revenues stood at $15.1 M during the fourth quarter of fiscal year 2023, compared to $13.0 M for the same quarter of last year, representing an increase of $2.1 M, or 15.8%. For the year ended June 30, 2023, revenues stood at $50.1 M compared to $42.4 M for the same period last year, representing an increase of $7.7 M, or 18.1%. Those increases in revenue for the three- and twelve-month periods were driven by an organic growth related to service activities and water treatment systems projects combined with a favorable foreign exchange impact.




The gross profit margin before depreciation and amortization stood at $3.4 M, or 22.3% for the fourth quarter of fiscal year 2023, compared to $2.6 M, or 19.7%, for the same period last year, representing an increase of $0.8 M, or 31.2%. For the year ended June 30, 2023, the gross profit margin before depreciation and amortization stood at $11.4 M, or 22.8% compared to $9.0 M, or 21.1%, for the same period last year, representing an increase of $2.4 M, or 27.6%. The increase of the gross profit margin in % is due to higher percentage of revenue coming from service activities which generally bring higher gross profit margin combined with improved project performance.

The selling and general expenses stood at $2.1 M during the fourth quarter of fiscal year 2023, compared to $1.6 M, for the same period last year, representing an increase of $0.5 M. For the year ended June 30, 2023, selling and general expenses stood at $6.9 M compared to $5.1 M, for the same period last year, representing an increase of $1.8 M primarily driven by the hiring of new sales resources, higher labour costs and commissions, resumption of travel and our participation to tradeshows and conferences.

[1] Gross profit margins presented before depreciation and amortization.
[2] Refer to the "Non-IFRS financial measurements" section. Refer to page 32 for detailed information about non-IFRS measures used in this MD&A.

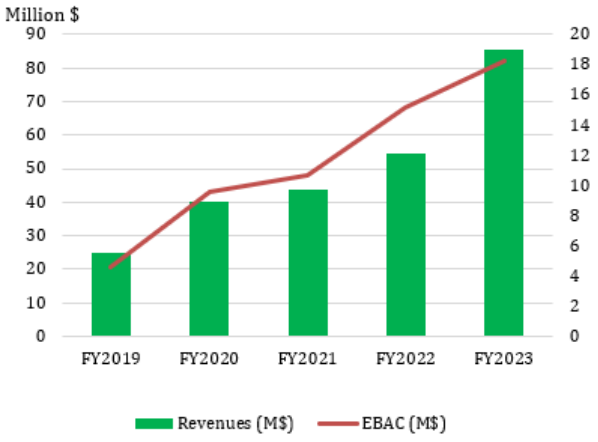
WTS's EBAC stood at $1.3 M during the fourth quarter of fiscal year 2023, compared to $1.0 M for the same period last year, representing an increase of $0.3 M, or 30.6%, and an increase in percentage over revenues due to higher gross profit margins. For the year ended June 30, 2023, WTS's EBAC increased at $4.6 M compared to $3.9 M for the same period last year, representing an increase of $0.7 M or 17.1%. The increase of WTS's EBAC in dollars is mainly attributable to the improvement of the gross profit margin before depreciation and amortization, but the decrease in percentage over revenues is due to higher selling and general expenses to support important sales growth.

**SPECIALTY PRODUCTS**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Revenues from Specialty Products | **18,987** | 13,360 | 5,627 | 42.1 | **85,527** | 54,397 | 31,130 | 57.2 |
| *Organic growth* | | | *3,205* | *24.0* | | | *18,947* | *34.8* |
| *Acquisition growth* | | | *1,696* | *12.7* | | | *12,158* | *22.4* |
| *FX impact* | | | *726* | *5.4* | | | *25* | *0.0* |
| Cost of goods sold | **12,071** | 7,148 | 4,923 | 68.9 | **51,484** | 28,779 | 22,705 | 78.9 |
| Gross profit margin[1] | **6,916** | 6,212 | 704 | 11.3 | **34,043** | 25,618 | 8,425 | 32.9 |
| Gross profit margin (%)[1] | **36.4%** | 46.5% | - | - | **39.8%** | 47.1% | - | - |
| Selling and general expenses | **4,222** | 2,784 | 1,438 | 51.7 | **15,756** | 10,425 | 5,331 | 51.1 |
| EBAC[2] from Specialty Products | **2,694** | 3,428 | (734) | (21.4) | **18,287** | 15,193 | 3,094 | 20.4 |
| EBAC[2] over revenues from Specialty Product | **14.2%** | 25.7% | - | - | **21.4%** | 27.9% | - | - |

Specialty Products revenues include revenues coming from the sale of maple equipment and related products, specialty chemicals, consumables, and components dedicated to the water treatment industry.

Specialty Products revenues stood at $19.0 M during the fourth quarter of fiscal year 2023, compared to $13.4 M for the same quarter of last year, representing an increase of $5.6 M, or 42.1%, with an organic revenue growth of $3.2 M, or 24.0%. Leader, which was acquired on June 30, 2022, generated $1.7 M, or 12.7%, of acquisition growth. For the year ended June 30, 2023, revenues stood at $85.5 M compared to $54.4 M for the same period last year, representing an increase of $31.1 M, or 57.2%. Those increases for the three-month period and the year ended June 30, 2023, were mainly driven by strong sales and an efficient marketing strategy execution combined with additional strategic sales resources. We delivered components and consumables to large desalination plants and penetrated strategic regions in the Middle East during the third quarter, and this momentum was sustained during the fourth quarter with a breakthrough in the Israeli market. Furthermore, enhanced sales synergies between our various product lines were achieved combined with the Leader acquisition growth of $12.1 M, which led to a significant revenue growth.




The gross profit margin before depreciation and amortization stood at $6.9 M, or 36.4%, for the fourth quarter of fiscal year 2023, compared with $6.2 M, or 46.5% for the same period last year, representing an increase of $0.7 M but a decrease of the gross profit margin in percentage of 10.1%. For the year ended June 30, 2023, the gross profit margin before depreciation and amortization stood at $34.0 M, or 39.8%, compared to $25.6 M, or 47.1% for the same period

[1] Gross profit margins presented before depreciation and amortization.
[2] Refer to the "Non-IFRS financial measurements" section. Refer to page 32 for detailed information about non-IFRS measures used in this MD&A.

last year, representing an increase of $8.4 M but a decrease in percentage of 7.3%. However, our investments to insource some of the manufacturing of specialty products should enable us to improve our gross profit while remaining competitive.

The gross profit margin variations are explained by two main reasons. The first reason is the business mix within the Specialty Products business pillar, since more revenues come from maple farming equipment following the acquisition of Leader, which are usually at lower average gross margin. It had a bigger impact during the fourth quarter since the maple industry faced the worst season in five years due to unseasonable weather conditions. The second reason is the increase of raw material costs for the manufacturing of our specialty chemicals due to the global economic context.

The selling and general expenses stood at $4.2 M during the fourth quarter of fiscal year 2023, compared to $2.8 M, for the same quarter of the previous fiscal year, representing an increase of $1.4 M. For the year ended June 30, 2023, selling and general expenses stood at $15.8 M compared to $10.4 M, for the same period of the previous year, representing an increase of $5.4 M. The hiring of sales resources, the pressure on salaries due to the inflation level, and the resumption of travel combined with the acquisition of Leader are the main factors behind those variations. Despite the increase in selling and general expenses, the percentage of expenses over revenues decreased for the three- and twelve-month periods by 1.4% and 0.7% respectively.

Specialty Products' EBAC stood at $2.7 M during the fourth quarter of fiscal year 2023, compared to $3.4 M for the same quarter of last fiscal year, representing a decrease of $0.7 M, or 21.4%. The decrease of Specialty Products' EBAC in dollar and % during the quarter is mainly attributable to the gross profit margin decrease in connection with maple farming equipment unusual hard season.

For the year ended June 30, 2023, Specialty Products' EBAC stood at $18.3 M, compared to $15.2 M for the same period of last year, representing an increase of $3.1 M, or 20.4%. Even if Specialty Products' EBAC was positively impacted by strong sales growth, pressure on gross margin and business mix between specialty chemicals, components, consumables, and maple farming equipment negatively affected the ratios.

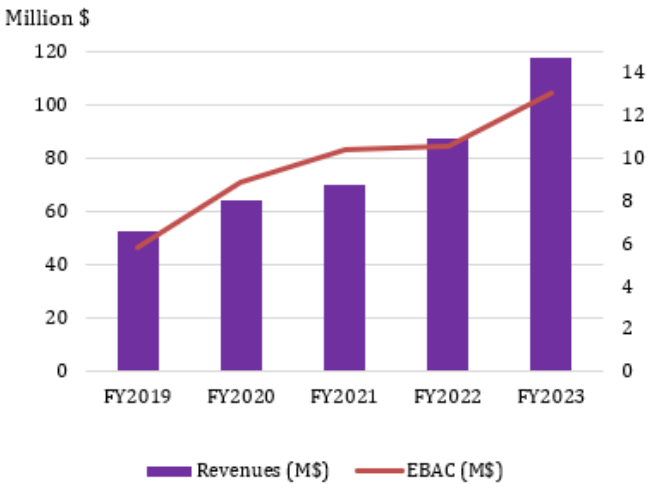
**O&M**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Revenues from O&M | **30,916** | 25,689 | 5,227 | 20.3 | **117,654** | 87,519 | 30,135 | 34.4 |
| *Organic growth* | | | *3,722* | *14.5* | | | *12,691* | *14.5* |
| *Acquisition growth* | | | - | - | | | *12,149* | *13.9* |
| *FX impact* | | | *1,505* | *5.8* | | | *5,295* | *6.0* |
| Cost of goods sold | **25,899** | 20,994 | 4,905 | 23.4 | **99,389** | 72,502 | 26,887 | 37.1 |
| Gross profit margin[1] | **5,017** | 4,695 | 322 | 6.9 | **18,265** | 15,017 | 3,248 | 21.6 |
| Gross profit margin (%)[1] | **16.2%** | 18.3% | - | - | **15.5%** | 17.2% | - | - |
| Selling and general expenses | **1,632** | 1,212 | 420 | 34.7 | **5,208** | 4,484 | 724 | 16.1 |
| EBAC[2] from O&M | **3,385** | 3,483 | (98) | (2.8) | **13,057** | 10,533 | 2,524 | 24.0 |
| EBAC[2] over revenues from O&M | **10.9%** | 13.6% | - | - | **11.1%** | 12.0% | - | - |

O&M revenues stood at $30.9 M during the fourth quarter of fiscal year 2023, compared to $25.7 M for the same quarter of the previous fiscal year, representing an increase of $5.2 M, or 20.3%. For the year ended June 30, 2023, revenues stood at $117.7 M, compared to $87.5 M for the same period last year, representing an increase of $30.2 M, or 34.4%. The O&M business pillar showed an organic growth for the three-month period and the year ended June 30, 2023, respectively for $3.7 M, or 14.5% and $12.7 M, or 14.5%. Those increases are coming both from important scope expansions and new

[1] Gross profit margins presented before depreciation and amortization.
[2] Refer to the "Non-IFRS financial measurements" section. Refer to page 32 for detailed information about non-IFRS measures used in this MD&A.

projects secured in previous quarters. The acquisitions of JCO and EC contributed to an acquisition growth for the year ended June 30, 2023, for $12.1 M, or 13.9%, combined with a favorable foreign exchange rate impact. Furthermore, in most of the O&M contracts, the Corporation is entitled to increase the annual fees based on the CPI. Such annual fee increases are addressed with our customers as each contract reaches its annual contractual adjustment date.




The gross profit margin before depreciation and amortization increased at $5.0 M, or 16.2% for the fourth quarter of fiscal year 2023, compared with $4.7 M, or 18.3%, for the same period last year, representing an increase of $0.3 M, or 6.9%. For the year ended June 30, 2023, gross profit margin before depreciation and amortization increased at $18.3 M, or 15.5%, compared with $15.0 M, or 17.2%, for the same period last year, representing an increase of $3.3 M, or 21.6%. The gross profit margin in % decreased for the fourth quarter of fiscal year 2023 and the year ended June 30, 2023, as a result of the pressure on employee salaries and continued inflation. Since more than 65.0% of the Corporation's employees are working for this business pillar, the factors related to the workforce are more impactful. Hence, to create a safe and attractive environment for our workforce, and to create value for our customers by offering them a talented team, a minimum wage of US $15/hour was established at the beginning of this year for all our employees of this business pillar.

The selling and general expenses stood at $1.6 M during the fourth quarter of fiscal year 2023, compared to $1.2 M for the same period last year. For the year ended June 30, 2023, selling and general expenses stood at $5.2 M compared to $4.5 M for the same period last year. Those increases in selling and general expenses were driven primarily by higher employee compensation costs. Moreover, the percentage of selling and general expenses over revenues for the three-month period remains stable, the % for the year ended June 30, 2023, decreased by 0.7%.

O&M's EBAC stood at $3.4 M during the fourth quarter of fiscal year 2023, compared to $3.5 M for the same period last year, representing a decrease of $0.1 M, or 2.8%. For the year ended June 30, 2023, O&M's EBAC stood at $13.1 M compared to $10.5 M for the same period last year, representing an increase of $2.6 M, or 24.0%. However, the O&M EBAC decreased in % due primarily to lower gross profit margin explained by higher pressure on labor costs.

## LIQUIDITY AND CAPITAL RESOURCES

This section is intended to provide the reader with a better understanding of the Corporation's liquidity and capital resources.

### CASH FLOWS ANALYSIS

A comparison of the Corporation's cash flows for the three-month periods and years ended June 30, 2023, and June 30, 2022, is presented below:

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | | | Years ended June 30, | | | |
|---|---|---|---|---|---|---|---|---|
| | **2023** | 2022 | Variation | | **2023** | 2022 | Variation | |
| | **$** | $ | $ | % | **$** | $ | $ | % |
| Cash flows from operating activities before change in working capital items | **3,004** | 3,157 | (153) | (4.8) | **20,346** | 16,494 | 3,852 | 23.4 |
| Change in working capital items | **11,902** | (9,449) | 21,351 | (226.0) | **9,555** | (21,038) | 30,593 | (145.4) |
| | **14,906** | (6,292) | 21,198 | (336.9) | **29,901** | (4,544) | 34,445 | (758.0) |
| Interests received / Income taxes paid | **(424)** | (98) | (326) | 332.7 | **(1,039)** | (1,706) | 667 | (39.1) |
| Cash flows from (used in) operating activities | **14,482** | (6,390) | 20,872 | (326.6) | **28,862** | (6,250) | 35,112 | (561.8) |
| Cash flows used in investing activities | **(2,699)** | (6,246) | 3,547 | (56.8) | **(16,143)** | (32,647) | 16,504 | (50.6) |
| Cash flows from (used in) financing activities | **(5,411)** | 13,504 | (18,915) | (140.1) | **(2,696)** | 30,769 | (33,465) | (108.8) |
| Effect of exchange rate changes on the balance of cash held in foreign currencies | **165** | 16 | 149 | 931.3 | **(334)** | 101 | (435) | (430.7) |
| Net change | **6,537** | 884 | 5,653 | 639.5 | **9,689** | (8,027) | 17,716 | (220.7) |
| Cash – Beginning of period | **10,534** | 6,498 | 4,036 | 62.1 | **7,382** | 15,409 | (8,027) | (52.1) |
| Cash – End of period | **17,071** | 7,382 | 9,689 | 131.3 | **17,071** | 7,382 | 9,689 | 131.3 |

Cash increased by $6.5 M during the fourth quarter of fiscal year 2023, compared with an increase of $0.9 M for the comparable quarter of the previous year. The variation is explained by the following:

#### Cash Flows from Operating Activities

Cash flows from operating activities generated $14.5 M for the fourth quarter of fiscal year 2023, compared to $6.4 M of cash flows used during the same period of the previous year. For the twelve-month period ended June 30, 2023, cash flows from operating activities generated $28.9 M, compared to $6.3 M of cash flows used during the comparable period last year. The variation is mainly explained by the favorable changes in working capital items.

#### Cash Flows from Investing Activities

Investing activities used $2.7 M of cash flows for the fourth quarter of fiscal year 2023, compared to $6.2 M of cash flows used in investing activities during the comparable quarter of the previous year. The variation was primarily due to lower acquisition of property, plant and equipment.

For the twelve-month period ended June 30, 2023, cash flows from investing activities used $16.1 M, compared to $32.6 M during the comparable period last year. The variation was primarily due to the business combination of $21.1 M in fiscal year 2022, compensated by higher payments of contingent considerations of $6.1 M.

**Cash Flows from Financing Activities**

Financing activities used $5.4 M for the quarter ended June 30, 2023, compared to $13.5 M of cash flows generated by financing activities during the comparable quarter of the previous year. For the twelve-month period ended June 30, 2023, cash flows from financing activities used $2.7 M, compared to $30.8 M of cash flows generated by financing activities during the comparable period of the previous year. Those variations for the three- and twelve-month periods ended June 30, 2023, are explained by the variation of the bank loan and long-term debt reimbursement compensated by higher payments of lease liabilities and higher interest payments.

## FINANCIAL POSITION

The following is an analysis of the changes to the Corporation's financial position between June 30, 2023, and June 30, 2022, for selected information:

| (In thousands of Canadian dollars) | **June 30, 2023** | June 30, 2022 | Variation | | Explanations |
|---|---|---|---|---|---|
| | **$** | $ | $ | % | |
| Accounts receivable | **36,629** | 35,696 | 933 | 2.6 | The increase is mostly attributable to the foreign exchange rate impact of $1.3 M or 3.8%, therefore demonstrating improved collection efforts since accounts receivable remained relatively stable compare to sales increase of 24.8% for the fourth quarter. |
| Inventories | **20,459** | 20,171 | 288 | 1.4 | The increase is mostly attributable to foreign exchange rate variations of $0.5 M or 2.5%. |
| Contract assets | **11,087** | 11,591 | (504) | (4.3) | The decrease is mostly attributable to the timing of deliveries or invoicing of projects in the WTS business pillar. |
| Prepaid expenses and deposits | **1,636** | 4,236 | (2,600) | (61.4) | On June 30, 2022, to ensure on-time supplier deliveries and to respond to supply chain matters, the Corporation had high supplier advances. On June 30, 2023, the decrease is mainly due to deliveries and the use of supplier advance payments. |
| Accounts payable and accrued liabilities | **28,889** | 23,600 | 5,289 | 22.4 | The increase is partly attributable to the foreign exchange rate impact of $1.4 M, higher compensation and benefits payable of $1.6 M, combined with the timing of payments to suppliers. |
| Contract liabilities | **7,810** | 6,207 | 1,603 | 25.8 | The increase is attributable to the difference between project advancement and project invoicing schedules. |
| Contingent considerations, including current portion | **5,144** | 10,017 | (4,873) | (48.6) | The decrease is related to payments of contingent considerations. |

**NET DEBT**

The definition of net debt consists of long-term debt less cash, excluding and/or including contingent considerations. Net debt is a non-IFRS measure without a standardized definition within IFRS and is used by management to measure the liquidity of the Corporation. The definition of net debt used by the Corporation may differ from those used by other companies.

| (In thousands of Canadian dollars) | **June 30, 2023** | June 30, 2022 | Variation | |
|---|---|---|---|---|
| | **$** | $ | $ | % |
| Bank loans | **51,274** | 45,562 | 5,712 | 12.5 |
| Current portion of long-term debt | **243** | 1,563 | (1,320) | (84.5) |
| Long-term debt | **299** | 510 | (211) | (41.4) |
| Contingent considerations | **5,144** | 10,017 | (4,873) | (48.6) |
| Less: Cash | **(17,071)** | (7,382) | (9,689) | (131.3) |
| **Net debt including contingent considerations** [(1)] | **39,889** | 50,270 | (10,381) | (20.7) |
| Contingent considerations | **5,144** | 10,017 | (4,873) | (48.6) |
| **Net debt excluding contingent considerations ("Net debt")** [(1)] | **34,745** | 40,253 | (5,508) | (13.7) |
| **Adjusted EBITDA** [(1)] | **21,404** | 18,101 | 3,303 | 18.2 |

[(1)] Non-IFRS measure. Refer to the "Non-IFRS financial measurements" section on page 32 for detailed information about the non-IFRS measures used in this MD&A.

As at June 30, 2023, the net debt including contingent considerations stood at $39.9 M, compared with $50.3 M as at June 30, 2022, representing a $10.4 M decrease mainly attributable to a higher cash balance.

**CAPITAL MANAGEMENT**

The Corporation's objective in managing capital is to ensure sufficient liquidity to pursue its growth while at the same time taking a prudent approach towards financial leverage and risks.

The Corporation's capital is composed of net debt and shareholders' equity. The Corporation's primary uses of capital are to finance increases in non-cash working capital and capital expenditures for capacity expansion and integration. The Corporation monitors its performance through different ratios such as those required under its credit facility and long-term debt arrangements.

Credit facility and long-term debt arrangements require that the Corporation meet certain financial ratios on a quarterly basis. The financial ratios are, as at June 30, 2023:

- Total Debt-to-EBITDA ratio, defined as total debt divided by EBITDA not exceeding a certain limit at all times.
- Fixed charge coverage ratio, including all capital and interest payments on borrowings due and capital expenditures not exceeding a certain limit at all times.

These terms and ratios are defined in the credit facility agreements and do not correspond to the Corporation's metrics described in section "Non-IFRS financial measurements," or to other terms used in this MD&A. As at June 30, 2023, and 2022 for the year then ended, the Corporation complies with the ratios required under its credit agreements.

**OFF-BALANCE SHEET ARRANGEMENTS**

As at June 30, 2023, the Corporation had off-balance sheet arrangements consisting of letters of credit amounting to $3.1 M, which expire at various dates through fiscal year 2025. Of these letters of credit, $3.1 M is secured by EDC.

**OUTSTANDING SHARES**

As at June 30, 2023, the Corporation had 90,007,408 common shares issued and outstanding, as well as 5,901,834 outstanding stock options.

## NON-IFRS FINANCIAL MEASUREMENTS

In this MD&A, the Corporation's management uses measurements that are not in accordance with IFRS. The measurements presented below are not defined by IFRS and cannot be formally presented in the consolidated financial statements. These non-IFRS measures are presented as additional information and should be used in conjunction with the IFRS financial measurements presented in this report.

### EBITDA AND ADJUSTED EBITDA

EBITDA means earnings before finance costs – net, income taxes, depreciation and amortization. The definition of adjusted EBITDA excludes expenses otherwise considered in net earnings (loss) according to Generally Accepted Accounting Principles ("GAAP"), namely the unrealized exchange (gains) losses, the change in fair value of contingent considerations, the uplisting fees, the gain on debt extinguishment and the stock-based compensation costs. These items are non-cash items and do not have an impact on the operating and financial performance of the Corporation. Management has also elected to exclude the acquisition and integration costs, as they are not directly linked to the operations. The reader can establish the link between adjusted EBITDA and net earnings (loss) based on the reconciliation presented below. The definition of adjusted EBITDA used by the Corporation may differ from those used by other companies. Even though adjusted EBITDA is a non-IFRS measure, it is used by management to make operational and strategic decisions. Providing this information to the stakeholders, in addition to the GAAP measures, allows them to see the Corporation's results through the eyes of management, and to better understand the financial performance, notwithstanding the impact of GAAP measures.

### RECONCILIATION OF NET EARNINGS (LOSS) TO EBITDA AND TO AJDUSTED EBITDA

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | Years ended June 30, | |
|---|---|---|---|---|
| | **2023** | 2022 | **2023** | 2022 |
| | **$** | $ | **$** | $ |
| Net earnings (loss) for the period | **(2,289)** | 2,445 | **(1,296)** | 5,107 |
| Finance costs – net | **1,563** | 753 | **5,749** | 2,359 |
| Income taxes (recovery) | **(505)** | (3,927) | **750** | (3,618) |
| Depreciation of property, plant and equipment and right-of-use assets | **1,622** | 1,122 | **5,814** | 3,812 |
| Amortization of intangible assets | **1,608** | 1,606 | **6,428** | 5,419 |
| **EBITDA** | **1,999** | 1,999 | **17,445** | 13,079 |
| Gain on debt extinguishment | **-** | - | **(1,029)** | - |
| Unrealized exchange (gain) loss | **219** | 484 | **532** | (181) |
| Stock-based compensation costs | **428** | 480 | **2,180** | 1,303 |
| Changes in fair value of the contingent considerations | **148** | 1,114 | **1,090** | 2,565 |
| Acquisition and integration costs | **332** | 677 | **1,186** | 1,135 |
| Uplisting fees | **-** | - | **-** | 200 |
| **Adjusted EBITDA** | **3,126** | 4,754 | **21,404** | 18,101 |
| **Revenues** | **64,960** | 52,046 | **253,319** | 184,356 |
| **Adjusted EBITDA over revenues** | **4.8%** | 9.1% | **8.4%** | 9.8% |

**ADJUSTED EBITDA OVER REVENUES**

Adjusted EBITDA over revenues is a non-IFRS ratio used to analyze the profitability of the Corporation and to facilitate period-to-period comparisons, as well as comparison with peers. This ratio is calculated by dividing the amount of Adjusted EBITDA for a given period by the amount of revenue for the same period. Refer to the table above for the calculation of this ratio.

**ORGANIC REVENUE GROWTH**

Organic revenue is a non-IFRS financial measure corresponding to the amount of revenue of a given period, excluding the effect of acquisitions and foreign currency exchanges of the same period. This non-IFRS measure is used to analyze the level of activity of the Corporation, excluding the effect of certain transactions and the impact of foreign exchange fluctuations in order to facilitate period-to-period comparisons, as well as comparison with peers. Organic revenue growth is a non-IFRS ratio calculated by comparing the amount of organic revenue of a given period with the amount of revenue of the comparative period. Neither organic revenue and organic revenue growth have a standardized definition within IFRS, and other issuers may define these measures differently. Accordingly, these measures may not be comparable to similar measures used by other issuers.

**EARNINGS BEFORE ADMINISTRATIVE COSTS ("EBAC")**

The Corporation's definition of EBAC refers to the earnings before administrative cost and other items in note 25 of the consolidated financial statements. EBAC is a non-IFRS measure, and it is used by management to monitor financial performance and to make strategic decisions. The definition of EBAC used by the Corporation may differ from those used by other companies.

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | Years ended June 30, | |
|---|---|---|---|---|
| | **2023** | 2022 | **2023** | 2022 |
| | **$** | $ | **$** | $ |
| Revenue from external customers: | | | | |
| Revenue recognized over time | **38,604** | 34,192 | **146,695** | 115,364 |
| Revenue recognized at a point in time | **25,315** | 17,854 | **105,583** | 68,992 |
| Rental income | **1,041** | - | **1,041** | - |
| | **64,960** | 52,046 | **253,319** | 184,356 |
| Cost of goods sold | **49,673** | 38,582 | **189,564** | 134,749 |
| Gross profit before depreciation and amortization | **15,287** | 13,464 | **63,755** | 49,607 |
| Selling and general expenses | **7,931** | 5,575 | **27,844** | 19,981 |
| **Earnings before administrative costs (EBAC)** | **7,356** | 7,889 | **35,911** | 29,626 |

**ADJUSTED NET EARNINGS (LOSS)**

The definition of adjusted net earnings (loss) excludes acquisition and integration costs, amortization of intangible assets from acquisition, unrealized exchange (gain) loss, change in fair value of the contingent considerations, realized net gain on interest rate swap, deferred tax recovery and stock-based compensation costs. The reader can establish the link between net earnings (loss) and adjusted net earnings (loss) with the reconciliation items presented in this report. The definition of adjusted net earnings (loss) used by the Corporation may differ from those used by other companies. Adjusted net earnings (loss) and adjusted net earnings (loss) per share are non-IFRS measures and are used by management to monitor financial performance and to make strategic decisions.

**ADJUSTED NET EARNINGS (LOSS) PER SHARE ("ADJUSTED EPS")**

Adjusted net earnings (loss) per share ("Adjusted EPS") is defined as adjusted net earnings (loss), divided by the weighted average number of outstanding shares for the period. Adjusted EPS is a non-IFRS ratio that is an indicator of the financial performance of the Corporation's activities and allows the Corporation to present the adjusted net earnings (loss) on a basic and/or diluted share basis. Refer to the table below for a reconciliation of Adjusted basic and diluted EPS to diluted EPS (namely, net earnings (loss) per share) as determined under IFRS.

**RECONCILIATION OF NET EARNINGS (LOSS) TO ADJUSTED NET EARNINGS (LOSS)**

| (In thousands of Canadian dollars) | Three-month periods ended June 30, | | Years ended June 30, | |
|---|---|---|---|---|
| | **2023** | 2022 | **2023** | 2022 |
| | **$** | $ | **$** | $ |
| Net earnings (loss) for the period | **(2,289)** | 2,445 | **(1,296)** | 5,107 |
| Acquisition and integration costs | **332** | 677 | **1,186** | 1,135 |
| Amortization of intangible assets related to business combinations | **1,382** | 1,477 | **5,719** | 5,026 |
| Unrealized exchange (gain) loss | **219** | 484 | **532** | (181) |
| Changes in fair value of the contingent considerations | **148** | 1,114 | **1,090** | 2,565 |
| Stock-based compensation costs | **428** | 480 | **2,180** | 1,303 |
| Realized net gain on interest rate swap termination | **-** | - | **-** | (237) |
| Deferred tax recovery | **-** | (4,570) | **-** | (4,570) |
| Income taxes related to above items | **(396)** | (480) | **(1,615)** | (1,300) |
| **Adjusted net earnings (loss)** | **(176)** | 1,627 | **7,796** | 8,848 |
| **Adjusted basic EPS** | **(0.002)** | 0.018 | **0.087** | 0.100 |
| **Adjusted diluted EPS** | **(0.002)** | 0.018 | **0.083** | 0.094 |

**NET DEBT**

The definition of net debt consists of long-term debt less cash, excluding and/or including contingent considerations. The definition of net debt used by the Corporation may differ from those used by other companies. Refer to page 31 of this MD&A for the reconciliation. Net-debt-to-Adjusted EBITDA ratio is a non-IFRS measure without a standardized definition within IFRS. Net-debt-to-Adjusted EBITDA consists of Net debt excluding contingent considerations divided by Adjusted EBITDA. The Corporation uses this ratio as a measure of financial leverage and it is calculated using our trailing twelve-month adjusted EBITDA.

**O&M CONTRACTS RENEWAL RATE**

The O&M contracts retention rate is calculated with the number of O&M customers that either had long-term contracts or "evergreen" contracts at the end of fiscal year 2023 over the total number of customers. The definition of O&M contracts retention rate used by the Corporation may differ from those used by other companies.

**RECURRING REVENUES BY NATURE**

Recurring revenue by nature is a non-IFRS measure and is defined by management as the portion of the Corporation's revenue coming from customers with whom the Corporation has established a long-term relationship and/or coming from a business with a recurring customer sales pattern. However, there is no guarantee that recurring revenues will last indefinitely. The Corporation's recurring revenues are coming from the Specialty Products and O&M business pillars as well as the service activities of the WTS business pillar. This non-IFRS measure is used by management to evaluate the stability of revenues from one year to the other. The definition of recurring revenues by nature used by the Corporation may differ from those used by other companies.

| (In thousands of Canadian dollars) | **Three-month period ended June 30, 2023** | | | |
|---|---|---|---|---|
| | **WTS** | **Specialty Products** | **O&M** | **Total** |
| | **$** | **$** | **$** | **$** |
| Revenues | 15,057 | 18,987 | 30,916 | 64,960 |
| **Recurring revenues** | **7,369** | **18,987** | **30,916** | **57,272** |

| (In thousands of Canadian dollars) | **Year ended June 30, 2023** | | | |
|---|---|---|---|---|
| | **WTS** | **Specialty Products** | **O&M** | **Total** |
| | **$** | **$** | **$** | **$** |
| Revenues | 50,138 | 85,527 | 117,654 | 253,319 |
| **Recurring revenues** | **21,097** | **85,527** | **117,654** | **224,278** |

| (In thousands of Canadian dollars) | Three-month period ended June 30, 2022 | | | |
|---|---|---|---|---|
| | WTS | Specialty Products | O&M | Total |
| | $ | $ | $ | $ |
| Revenues | 12,997 | 13,360 | 25,689 | 52,046 |
| **Recurring revenues** | **4,494** | **13,360** | **25,689** | **43,543** |

| (In thousands of Canadian dollars) | Year ended June 30, 2022 | | | |
|---|---|---|---|---|
| | WTS | Specialty Products | O&M | Total |
| | $ | $ | $ | $ |
| Revenues | 42,440 | 54,397 | 87,519 | 184,356 |
| **Recurring revenues** | **14,595** | **54,397** | **87,519** | **156,511** |

## CLAIMS AND LITIGATION

Various claims and legal proceedings have been initiated against the Corporation in the normal course of its operating activities. Although the outcome of these proceedings cannot be determined with certainty, management estimates that any payments resulting from their outcome are not likely to have a substantial negative impact on the Corporation's consolidated financial statements. The Corporation limits its exposure to some risks of claims related to its activities by subscribing to insurance policies.

## RISK FACTORS

The Corporation is subject to a number of risks and uncertainties and is affected by a number of factors which could have a material adverse effect on the Corporation's business, financial condition, operating results or achievement the three-year strategic plan. The risks are discussed in the "Risk Factors" section of the Corporation's most recent Annual Information Form, available under our profile on SEDAR+ at www.sedarplus.ca.

## FINANCIAL RISK FACTORS

Please refer to note 22 of the audited annual consolidated financial statements for the year ended June 30, 2023, for a summary of financial risk management.

## ACCOUNTING POLICIES

The significant accounting policies are described in note 2 of the audited annual consolidated financial statements for the year ended June 30, 2023.

## CRITICAL ACCOUNTING ESTIMATES, ASSUMPTIONS AND JUDGEMENTS

The preparation of consolidated financial statements in accordance with IFRS often requires management to make estimates about and apply assumptions or subjective judgment to future events or other matters that affect the reported amounts of the Corporation's assets, liabilities, revenues, expenses and related disclosures. Assumptions, estimates and judgments are based on historical experience, expectations, current trends and other factors that management believes to be relevant at the time at which the Corporation's consolidated financial statements are prepared. Management reviews, on a regular basis, the Corporation's accounting policies, assumptions, estimates and judgments in order to ensure that the consolidated financial statements are presented fairly in accordance with IFRS.

Critical accounting estimates and judgments are those that have a significant risk of causing material adjustment and are often applied to matters or outcomes that are inherently uncertain and subject to change. As such, management cautions that future events often vary from forecasts and expectations and that estimates routinely require adjustment.

The summary of critical accounting estimates, assumptions and judgements are described in note 3 of the audited annual consolidated financial statements for the year ended June 30, 2023.

## NEW ACCOUNTING STANDARDS

The summary of accounting standards and amendments issued but not yet adopted are described in note 4 of the audited annual consolidated financial statements for the year ended June 30, 2023.

## CONTROLS AND PROCEDURES

In compliance with the Canadian Securities Administrators' National Instrument 52-109 ("NI 52-109"), the Corporation has filed certificates signed by the Chief Executive Officer ("CEO") and the Chief Financial Officer ("CFO") that, among other things, report on the design and effectiveness of disclosure controls and procedures and the design and effectiveness of internal controls over financial reporting.

### Disclosure Controls and Procedures

The CEO and CFO have designed disclosure controls and procedures, or have caused them to be designed under their supervision, in order to provide reasonable assurance that:

- material information relating to the Corporation has been made known to them; and
- information required to be disclosed in the Corporation's filings is recorded, processed, summarized, and reported within the time periods specified in securities legislation.

An evaluation was carried out, under the supervision of the CEO and the CFO of the effectiveness of the Corporation's disclosure controls and procedures. Based on this evaluation, the CEO and the CFO concluded that the disclosure controls and procedures are effective, using the criteria set forth by NI 52-109.

### Internal Controls over Financial Reporting

The CEO and the CFO have also designed internal controls over financial reporting or have caused them to be designed under their supervision in order to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with IFRS. The internal controls over financial reporting are designed using the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission 2013 (COSO 2013) on Internal Control – Integrated Framework. The work performed during the fiscal year allows them to conclude that the internal controls over financial reporting are effective for the year ended June 30, 2023.

### Changes in Internal Controls over Financial Reporting

There have been no changes in Corporation's internal control over reporting that occurred during the most recent interim period and year ended June 30, 2023 that has materially affected, or is reasonably likely to materially affect, the Corporation's internal control over financial reporting.

## MANAGEMENT'S RESPONSIBILITY FOR FINANCIAL REPORTING

The Consolidated Financial Statements and management's Discussion and Analysis ("MD&A") of $H_2O$ Innovation Inc. and all other information in the Annual Report are the responsibility of management and have been reviewed and approved by the Board of Directors.

The Consolidated Financial Statements have been prepared by management in accordance with International Financial Reporting Standards ("IFRS"). The MD&A has been prepared in accordance with the requirements of securities regulators. The Consolidated Financial Statements and MD&A include items that are based on best estimates and judgments of the expected effects of current events and transactions. Management has determined such items on a reasonable basis in order to ensure that the Consolidated Financial Statements and MD&A are presented fairly in all material respects. Financial information presented elsewhere in the Annual Report is consistent with that in the Consolidated Financial Statements.

$H_2O$ Innovation's Chief Executive Officer ("CEO") and Chief Financial Officer ("CFO") have designed disclosure controls and procedures, or have caused them to be designed under their supervision, to provide reasonable assurance that material information relating to $H_2O$ Innovation Inc. has been made known to them; and information required to be disclosed in $H_2O$ Innovation Inc.'s filings is recorded, processed, summarized and reported within the time periods specified in securities legislation.

$H_2O$ Innovation's CEO and CFO have also evaluated the effectiveness of $H_2O$ Innovation's disclosure controls and procedures as of June 30, 2023. Based on this evaluation, the CEO and the CFO concluded that the disclosure controls and procedures were effective as of that date. Based on this assessment, they determined that there were no material weaknesses in internal control over financial reporting, based on material weakness' definition set forth in NI 52-109. In compliance with NI 52-109, $H_2O$ Innovation's CEO and CFO have provided a certification related to $H_2O$ Innovation's annual disclosure to the Canadian Securities Administrators, including the Consolidated Financial Statements and MD&A.

The Board of Directors is responsible for ensuring that management fulfills its responsibilities for financial reporting and is ultimately responsible for reviewing and approving the Consolidated Financial Statements and MD&A. The Board of Directors carries out this responsibility principally through its Audit Committee.

The Audit Committee is appointed by the Board of Directors and is comprised entirely of independent and financially literate directors. The Audit Committee meets periodically with management, as well as with the external auditors, to review the Consolidated Financial Statements, external auditors' report, MD&A, auditing matters and financial reporting issues, to discuss internal controls over the financial reporting process, and to satisfy itself that each party is properly discharging its responsibilities. In addition, the Audit Committee has the duty to review the appropriateness of the accounting policies and significant estimates and judgments underlying the Consolidated Financial Statements as presented by management, and to review and make recommendations to the Board of Directors with respect to the fees of the external auditors. The Audit Committee reports its findings to the Board of Directors for its consideration when it approves the Consolidated Financial Statements and MD&A for issuance to shareholders.

The Consolidated Financial Statements prepared in accordance with IFRS have been audited by Ernst & Young LLP., the external independent auditor, in accordance with Canadian auditing standards on behalf of the shareholders. The external independent auditor has full and free access to the Audit Committee to discuss their audit and related matters.

The President and Chief Executive Officer

Frédéric Dugré

September 26, 2023

The Chief Financial Officer

Marc Blanchet

September 26, 2023

# CONSOLIDATED FINANCIAL STATEMENTS

June 30, 2023 and 2022

For additional information:
Investor Relations
*investor@h2oinnovation.com*

Trading symbols:
TSX: HEO
Growth Paris: MNEMO: ALHEO
OTCQX: HEOFF

Financial reports, annual reports and press releases are accessible on our website:
*www.h2oinnovation.com* and on SEDAR+.

# Independent auditor's report

To the shareholders of
**$H_2O$ Innovation Inc.**

## Opinion

We have audited the consolidated financial statements of **$H_2O$ Innovation Inc.** and its subsidiaries [the "Group"], which comprise the consolidated statements of financial position as at June 30, 2023 and 2022, and the consolidated statements of changes in shareholders' equity, consolidated statements of earnings (loss), consolidated statements of comprehensive earnings, and consolidated statements of cash flows for the years then ended, and notes to the consolidated financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying consolidated financial statements present fairly, in all material respects, the consolidated financial position of the Group as at June 30, 2023 and 2022, and its consolidated financial performance and its consolidated cash flows for the years then ended in accordance with International Financial Reporting Standards (IFRSs).

## Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's responsibilities for the audit of the consolidated financial statements* section of our report. We are independent of the Group in accordance with the ethical requirements that are relevant to our audit of the consolidated financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

## Key audit matters

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements of the current period. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters. For the matter below, our description of how our audit addressed the matter is provided in that context.

We have fulfilled the responsibilities described in the *Auditor's responsibilities for the audit of the consolidated financial statements* section of our report, including in relation to these matters. Accordingly, our audit included the performance of procedures designed to respond to our assessment of the risks of material misstatement of the consolidated financial statements. The results of our audit procedures, including the procedures performed to address the matters below, provide the basis for our audit opinion on the accompanying consolidated financial statements.

| Key audit matters | How our audit addressed the key audit matters |
|---|---|
| *Impairment test - Valuation of recoverable amount of the operation and maintenance ["O&M"] segment* | |
| As at June 30, 2023, goodwill attributed to the O&M segment amounted to $17.3 million. Management assesses at least annually, or at any time if an indicator of impairment exists, whether there has been an impairment loss in the carrying value of goodwill. When performing the impairment test, the recoverable amount was determined based on its value in use, which is calculated using a discounted pre-tax cash flow forecast. Significant judgments, estimates and assumptions in respect of impairment are disclosed in note 11 to the consolidated financial statements.<br><br>Auditing management's annual goodwill impairment test for the O&M segment was complex, given the degree of judgment and subjectivity in evaluating management's estimates and assumptions for determining the recoverable amount of the O&M segment as at April 1, 2023. Significant assumptions included revenue growth rates, earnings before interest, taxes, depreciation and amortization ["EBITDA"] margins and discount rate, which are affected by expectations about future market and economic conditions. | Our audit procedures included, among others:<br><br>• Involving our valuation specialists to assist in evaluating the Group's valuation methodology, the mathematical accuracy of the model and the discount rate used by comparing it to current market data available for comparable entities;<br>• Comparing management's significant assumptions used in the calculation to the Group's business plan and to analyst reports and revenue growth to publicly available industry reports and current market data available for comparable entities;<br>• Evaluating management's ability to accurately forecast information by comparing historical forecasts of the segment to actual results;<br>• Performing sensitivity analysis on key assumptions to evaluate changes in the recoverable amount that would result from changes in the underlying input; and<br>• Assessing the adequacy of the disclosures in the consolidated financial statements. |

| Key audit matters | How our audit addressed the key audit matters |
|---|---|
| *Revenue recognition – Estimate of total expected costs to complete project contracts* | |
| As described in note 2, the Group recognizes revenue for project contracts, which consists mainly of the design and custom-build of integrated water treatment systems, over time, using an input method, based on costs incurred to date relative to total estimated costs at completion, to measure progress toward satisfying such performance obligations. During the year ended June 30, 2023, the Group recognized $29 million of revenues from project contracts.<br><br>We identified the evaluation of the estimated costs to complete for in-progress project contracts at year-end as a key audit matter because of the significant judgment made by management to estimate costs to complete that drives the timing of revenue. Changes to costs to complete estimates can have a material impact on the amount of revenue recognized. These significant judgments include those related to estimated future labour and materials costs. These estimates are subjective and complex due to the long term and unique nature of many of the projects and are dependent on the status of the individual projects at year end. | Our audit procedures included, among others:<br><br>• Inspecting, on a sample basis, contracts, and, when applicable, change orders, to understand the contract scope and key terms and to assess the impact on estimated costs to complete;<br>• Interviewing, on a sample basis, operational personnel of the Group to evaluate reasonability of progress to date, the estimate of costs to be incurred to complete the project, and understand factors impacting the amount of time and costs to complete the project;<br>• Testing, on a sample basis, the estimated costs to be incurred by tracing underlying evidence such as vendor quotes, purchase orders, labour rates or historical costs appropriately adjusted for inflation for similar completed projects;<br>• Comparing, on a sample basis, the costs incurred and the estimated costs to complete to the original total estimated costs; and<br>• Assessing management's ability to forecast, by comparing the original total estimated costs to the total costs incurred for contracts completed during the year and by considering its consistency with recent results of operations. |

**Other information**

Management is responsible for the other information. The other information comprises:

- Management's discussion and Analysis ["MD&A"]; and
- The information, other than the consolidated financial statements and our auditor's report thereon, in the Annual Report.

Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the consolidated financial statements, our responsibility is to read the other information, and in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated.

We obtained the MD&A and the Annual Report prior to the date of this auditor's report. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact in this auditor's report. We have nothing to report in this regard.

**Responsibilities of management and those charged with governance for the consolidated financial statements**

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with IFRSs, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Group's financial reporting process.

**Auditor's responsibilities for the audit of the consolidated financial statements**

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Group's internal control.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the group audit. We remain solely responsible for our audit opinion.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

The engagement partner on the audit resulting in this independent auditor's report is Guillaume Pinard-Beaudoin.

Ernst & Young LLP [1]

Quebec City, Canada
September 26, 2023

[1] CPA auditor, public accountancy permit n° A133737

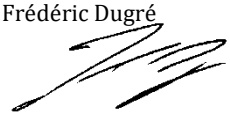
## CONSOLIDATED STATEMENTS OF FINANCIAL POSITION
## (in thousands of Canadian dollars)

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| **ASSETS (note 13)** | | |
| **Current assets** | | |
| Cash | **17,071** | 7,382 |
| Accounts receivable (notes 6 and 22) | **36,629** | 35,696 |
| Inventories (note 7) | **20,459** | 20,171 |
| Income taxes receivable (note 16) | **857** | 982 |
| Contract assets (note 19) | **11,087** | 11,591 |
| Prepaid expenses and deposits | **1,636** | 4,236 |
| | **87,739** | 80,058 |
| **Non-current assets** | | |
| Property, plant and equipment (note 8) | **21,431** | 15,632 |
| Intangible assets (note 9) | **43,443** | 47,993 |
| Right-of-use assets (note 10) | **15,683** | 16,012 |
| Other assets | **170** | 157 |
| Related party loans receivable (note 26 a) | **1,250** | 1,250 |
| Goodwill (notes 5 and 11) | **38,270** | 37,672 |
| Deferred income tax assets (note 16) | **6,330** | 6,889 |
| | **214,316** | 205,663 |
| **LIABILITIES** | | |
| **Current liabilities** | | |
| Accounts payable and accrued liabilities (note 12) | **28,889** | 23,600 |
| Provisions | **147** | 159 |
| Contract liabilities (note 19) | **7,810** | 6,207 |
| Contingent considerations (notes 5 and 15) | **5,144** | 10,017 |
| Current portion of long-term debt (note 14) | **243** | 1,563 |
| Current portion of lease liabilities (note 17) | **1,717** | 1,898 |
| | **43,950** | 43,444 |
| **Non-current liabilities** | | |
| Bank loans (note 13) | **51,274** | 45,562 |
| Long-term debt (note 14) | **299** | 510 |
| Other non-current financial liabilities | **-** | 173 |
| Deferred income tax liabilities (note 16) | **3,921** | 4,519 |
| Lease liabilities (note 17) | **15,147** | 15,027 |
| | **114,591** | 109,235 |
| **SHAREHOLDERS' EQUITY** | | |
| Share capital (note 18) | **129,735** | 130,027 |
| Reserve – Stock options (note 18) | **7,209** | 5,029 |
| Deficit | **(41,381)** | (40,085) |
| Accumulated other comprehensive income | **4,162** | 1,457 |
| | **99,725** | 96,428 |
| | **214,316** | 205,663 |

See accompanying notes to consolidated financial statements.

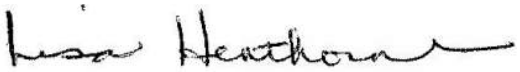
On behalf of the Board,

Frédéric Dugré



President and Chief Executive Officer

Lisa Henthorne



Chairwoman of the Board of Directors

## CONSOLIDATED STATEMENTS OF CHANGES IN SHAREHOLDERS' EQUITY
## (in thousands of Canadian dollars, except share data)

| | Common shares (number) (note 18) | Share capital (note 18) | Reserve – Stock option (note 18) | Reserve – Warrants (note 18) | Deficit | Accumulated other comprehensive income | Total |
|---|---|---|---|---|---|---|---|
| | | $ | $ | $ | $ | $ | $ |
| **Balance as at June 30, 2021** | 85,137,204 | 119,780 | 3,726 | 679 | (45,192) | 402 | 79,395 |
| Net earnings | - | - | - | - | 5,107 | - | 5,107 |
| Currency translation adjustments | - | - | - | - | - | 1,089 | 1,089 |
| Cash flow hedges net gains arising during the year (net of tax) | - | - | - | - | - | 203 | 203 |
| Net gain on cash flow hedges reclassified to consolidated statements of earnings | - | - | - | - | - | (237) | (237) |
| **Total comprehensive income** | - | - | - | - | 5,107 | 1,055 | 6,162 |
| Stock-based compensation costs (note 18) | - | - | 1,303 | - | - | - | 1,303 |
| Issuance of common shares (note 5) | 1,107,733 | 2,641 | - | - | - | - | 2,641 |
| Shares issued on warrants exercised | 3,762,471 | 5,939 | - | (679) | - | - | 5,260 |
| Share issue expenses | - | (22) | - | - | - | - | (22) |
| Deferred income tax recovery | - | 1,689 | - | - | - | - | 1,689 |
| **Balance as at June 30, 2022** | 90,007,408 | 130,027 | 5,029 | - | (40,085) | 1,457 | 96,428 |
| **Balance as at June 30, 2022** | **90,007,408** | **130,027** | **5,029** | **-** | **(40,085)** | **1,457** | **96,428** |
| Net loss | **-** | **-** | **-** | **-** | **(1,296)** | **-** | **(1,296)** |
| Currency translation adjustments | **-** | **-** | **-** | **-** | **-** | **2,705** | **2,705** |
| **Total comprehensive income** | **-** | **-** | **-** | **-** | **(1,296)** | **2,705** | **1,409** |
| Stock-based compensation costs (note 18) | **-** | **-** | **2,180** | **-** | **-** | **-** | **2,180** |
| Deferred income tax expense | **-** | **(292)** | **-** | **-** | **-** | **-** | **(292)** |
| **Balance as at June 30, 2023** | **90,007,408** | **129,735** | **7,209** | **-** | **(41,381)** | **4,162** | **99,725** |

See accompanying notes to consolidated financial statements.

## CONSOLIDATED STATEMENTS OF EARNINGS (LOSS)
## (in thousands of Canadian dollars, except per share data)

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Revenues (notes 19 and 25) | **253,319** | 184,356 |
| Cost of goods sold (note 20 a) | **189,564** | 134,749 |
| **Gross profit before depreciation and amortization** | **63,755** | 49,607 |
| Selling, general and administrative expenses (note 20 a) | **44,211** | 33,376 |
| Depreciation of property, plant and equipment and right-of-use assets (notes 8, 10 and 20 b) | **5,814** | 3,812 |
| Amortization of intangible assets (notes 9 and 20 b) | **6,428** | 5,419 |
| Other (gains) and losses – net (note 20 c) | **913** | 2,517 |
| Government tax credit (note 16) | **-** | (500) |
| Acquisition and integration costs (note 5) | **1,186** | 1,135 |
| **Operating costs total** | **58,552** | 45,759 |
| **Operating profit** | **5,203** | 3,848 |
| Finance income (note 26 a) | **(40)** | (33) |
| Finance costs | **5,789** | 2,392 |
| Finance costs – net | **5,749** | 2,359 |
| **Earnings (loss) before income taxes** | **(546)** | 1,489 |
| Current income tax expense (note 16) | **1,167** | 952 |
| Deferred tax expense (recovery) (note 16) | **(417)** | (4,570) |
| | **750** | (3,618) |
| **Net earnings (loss) for the year** | **(1,296)** | 5,107 |
| **Basic net earnings (loss) per share (note 21)** | **(0.014)** | 0.058 |
| **Diluted net earnings (loss) per share (note 21)** | **(0.014)** | 0.054 |
| Weighted average number of shares outstanding – Basic (note 21) | **90,007,408** | 88,189,057 |
| Weighted average number of shares outstanding – Diluted (note 21) | **90,007,408** | 93,900,881 |

See accompanying notes to consolidated financial statements.

## CONSOLIDATED STATEMENTS OF COMPREHENSIVE EARNINGS
## (in thousands of Canadian dollars)

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Net earnings (loss) for the year | (1,296) | 5,107 |
| Other comprehensive income (loss) - Items that may be reclassified subsequently to net earnings (loss) | | |
| Currency translation adjustments | 2,705 | 1,089 |
| Cash flow hedges net gains arising during the year (net of tax) | - | 203 |
| Net gain on cash flow hedges reclassified to consolidated statements of earnings (loss) | - | (237) |
| Comprehensive earnings for the year | 1,409 | 6,162 |

See accompanying notes to consolidated financial statements.

## CONSOLIDATED STATEMENTS OF CASH FLOWS
## (in thousands of Canadian dollars)

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| **Operating activities** | | |
| Earnings (loss) before income taxes for the year | **(546)** | 1,489 |
| Adjustments to reconcile earnings (loss) before income taxes to net cash flows | | |
| Finance costs – net | **5,749** | 2,359 |
| Depreciation of property, plant and equipment and right-of-use assets (notes 8, 10 and 20 b) | **5,814** | 3,812 |
| Amortization of intangible assets (notes 9 and 20 b) | **6,428** | 5,419 |
| Changes in fair value of contingent considerations (note 15) | **1,090** | 2,565 |
| Others | **255** | 186 |
| Net change in tax credit | **-** | (500) |
| Net unrealized foreign exchange differences | **405** | (139) |
| Stock-based compensation costs | **2,180** | 1,303 |
| Gain on debt extinguishment (note 14) | **(1,029)** | - |
| | **20,346** | 16,494 |
| Change in working capital items | **9,555** | (21,038) |
| Interests received | **40** | 33 |
| Income taxes paid | **(1,079)** | (1,739) |
| Net cash flows from (used in) operating activities | **28,862** | (6,250) |
| **Investing activities** | | |
| Variation of other assets | **-** | 43 |
| Acquisition of property, plant and equipment (note 8) | **(9,063)** | (9,658) |
| Acquisition of intangible assets (note 9) | **(1,029)** | (806) |
| Business combination, net of cash acquired (note 5) | **-** | (21,133) |
| Payment of contingent consideration (note 15) | **(6,051)** | (1,093) |
| Net cash flows used in investing activities | **(16,143)** | (32,647) |
| **Financing activities** | | |
| Variation of bank loans | **5,644** | 45,767 |
| Net proceeds from long-term debt contracted (note 14) | **-** | 64 |
| Long-term debt reimbursement (note 14) | **(660)** | (15,953) |
| Payment of lease liabilities (note 17) | **(2,834)** | (2,171) |
| Interest paid | **(4,846)** | (1,972) |
| Warrants exercised | **-** | 5,260 |
| Share issue expenses (note 5) | **-** | (22) |
| Net cash flows from (used in) financing activities | **(2,696)** | 30,769 |
| Net change in cash | **10,023** | (8,128) |
| **Effect of exchange rate changes on the balance of cash held in foreign currencies** | **(334)** | 101 |
| **Increase (decrease) in cash** | **9,689** | (8,027) |
| Cash – Beginning of the year | **7,382** | 15,409 |
| **Cash – End of the year** | **17,071** | 7,382 |

See accompanying notes to consolidated financial statements.

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

## 1. Description of business

H2O Innovation Inc. ("H2O Innovation" or the "Corporation") is incorporated under the Canada Business Corporations Act. The Corporation designs and provides state-of-the-art, custom-built, and integrated water treatment solutions based on membrane filtration technology for municipal, energy and natural resources end-users. The Corporation's activities rely on three pillars, which are: i) water technologies and services ("WTS"); ii) specialty products, including a complete line of maple equipment and products, specialty chemicals, consumables, and specialized products for the water treatment industry (couplings and cartridge filters) ("Specialty Products"); and iii) operation and maintenance services for water and wastewater treatment systems ("O&M"). The registered office of the Corporation is located at 330 Saint-Vallier Street East, Suite 340, Quebec City, Quebec, G1K 9C5, Canada.

The Corporation's common shares are listed on the Toronto Stock Exchange ("TSX") under the symbol HEO.

## 2. Basis of preparation

### Statement of Compliance

These consolidated financial statements have been prepared in accordance with International Financial Reporting Standards (IFRS). The consolidated financial statements have been prepared on a going concern basis, under the historical cost convention, except for contingent consideration which is measured at fair value.

On September 26, 2023, the Board reviewed and approved these consolidated financial statements and authorized its publication.

### Reporting and functional currency

The Corporation's reporting currency is the Canadian dollar. All values are rounded up to the nearest thousand dollars, except where otherwise indicated. Each foreign operation determines its own functional currency, and items included in the financial statements of each foreign operation are measured using that functional currency. The functional currency of each wholly owned entity of the group is the following:

| | |
|---|---|
| H2O Innovation Inc. | Canadian dollar |
| H2O Innovation USA Inc. | US dollar |
| Professional Water Technologies, L.L.C | US dollar |
| Piedmont Pacific Corporation | US dollar |
| Piedmont Pacific Inc. | Canadian dollar |
| Piedmont Hong Kong Limited | US dollar |
| H2O Innovation Operation & Maintenance, L.L.C | US dollar |
| JCO, Inc. | US dollar |
| Environmental Consultants, L.L.C | US dollar |
| Genesys International Limited | British pound |
| Genesys Membrane Products, S.L.U. | Euro |
| Genesys Membrane Products Latinoamericana Limitada | Chilean peso |

### Principles of consolidation

Subsidiaries are entities controlled by the Corporation. The financial statements of the subsidiaries are included in the consolidated financial statements from the date that control commences until the date that control ceases. The accounting policies of subsidiaries have been changed when necessary to align them with the policies adopted by the Corporation.

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

*Subsidiaries*
Subsidiaries are all entities over which the Corporation has control. Control is achieved when the Corporation has all three of the following elements: the power to direct the relevant activities of the subsidiary, exposure or rights to variable returns from its involvement with the subsidiary; and the ability to use its power over the subsidiary to affect the amount of the Corporation's returns. The Corporation reassesses whether or not it controls an investee if facts and circumstances indicate that there are changes to one or more of the three elements of controls listed above. Subsidiaries are fully consolidated from the date on which control is transferred to the Corporation. They are deconsolidated from the date that control ceases.

Intercompany transactions, balances and unrealized gains and losses on transactions between group companies are eliminated. Accounting policies of subsidiaries have been changed where necessary to ensure consistency with the policies adopted by the group.

*Investment in associates*
An associate is an entity over which the Corporation has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control or joint control over those policies. The considerations made in determining significant influence are similar to those necessary to determine control over subsidiaries. The Corporation's investment in its associate are accounted for using the equity method. Under the equity method, the investment in an associate is initially recognized at cost. The carrying amount of the investment is adjusted to recognize changes in the Corporation's share of net assets of the associate since the acquisition date. Goodwill relating to the associate is included in the carrying amount of the investment and is not tested for impairment separately.

The consolidated statements of earnings (loss) reflects the Corporation's share of the results of operations of the associate. Any change in the other comprehensive income ("OCI") of those investees is presented as part of the Corporation's OCI. In addition, when there has been a change recognized directly in the equity of the associate, the Corporation recognizes its share of any changes, when applicable, in the consolidated statements of changes in shareholders' equity. Unrealized gains and losses resulting from transactions between the Corporation and the associate are eliminated to the extent of the interest in the associate. The aggregate of the Corporation's share of profit or loss of an associate is shown on the face of the consolidated statements of earnings (loss) outside operating profit and represents profit or loss after tax and noncontrolling interests in the subsidiaries of the associate. When necessary, adjustments are made to bring the accounting policies in line with those of the Corporation.

After application of the equity method, the Corporation determines whether it is necessary to recognize an impairment loss on its investment in its associate. At each reporting date, the Corporation determines whether there is objective evidence that the investment in the associate is impaired. If there is such evidence, the Corporation calculates the amount of impairment as the difference between the recoverable amount of the associate and its carrying value, and then recognizes the loss within 'Share of profit of an associate' in the consolidated statements of earnings (loss). Upon loss of significant influence over the associate, the Corporation measures and recognizes any retained investment at its fair value. Any difference between the carrying amount of the associate upon loss of significant influence and the fair value of the retained investment and proceeds from disposal is recognized in profit or loss.

*Business combinations and goodwill*
Business combinations are accounted for using the acquisition method. The cost of an acquisition is measured as the aggregate of the consideration transferred, which is measured at acquisition date fair value, and the amount of any non-controlling interests in the acquiree. Acquisition costs are expensed as incurred in the consolidated statements of earnings (loss).

At the acquisition date, the identifiable assets acquired and the liabilities assumed are recognized at their fair value at the acquisition date, except that:

- deferred tax assets or liabilities and liabilities or assets related to employee benefit arrangements are recognized and measured in accordance with *IAS 12, Income Taxes* and *IAS 19, Employee Benefits* respectively;
- assets (or disposal groups) that are classified as held for sale in accordance *with IFRS 5, Non-current Assets Held for Sale and Discontinued Operations* are measured in accordance with that Standard.

Goodwill is initially measured at cost, being the excess of the aggregate of the consideration transferred, the amount of any non-controlling interests in the acquiree, and the fair value of the acquirer's previously held equity interest in the acquiree (if any) over the net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed. If, after reassessment, the net of the acquisition-date amounts of the identifiable assets acquired and liabilities assumed exceeds the aggregate of the consideration transferred, the amount of any non-controlling interests in the acquiree and the fair value of the acquirer's previously held interest in the acquiree (if any), the excess is recognized immediately in the consolidated statements of earnings (loss) as a bargain purchase gain.

When the consideration transferred by the Corporation in a business combination includes assets or liabilities resulting from a contingent consideration arrangement, the contingent consideration is measured at its acquisition-date fair value and included as part of the consideration transferred in a business combination.

The subsequent accounting for changes in the fair value of the contingent consideration that do not qualify as measurement period adjustments depends on how the contingent consideration is classified. Contingent consideration that is classified as equity is not remeasured at subsequent reporting dates and its subsequent settlement is accounted for within equity. Contingent consideration that is classified as an asset or a liability is remeasured at subsequent reporting dates in accordance with *IFRS 9, Financial Instruments*, as appropriate, with the corresponding gain or loss being recognized in the consolidated statements of earnings (loss).

Changes in the fair value of the contingent consideration that qualify as measurement period adjustments are adjusted retrospectively, with corresponding adjustments against goodwill. Measurement period adjustments are adjustments that arise from additional information obtained during the 'measurement period' (which cannot exceed one year from the acquisition date) about facts and circumstances that existed at the acquisition date.

If the initial accounting for a business combination is incomplete by the end of the reporting period in which the combination occurs, the Corporation reports provisional amounts for the items for which the accounting is incomplete. Those provisional amounts are adjusted during the measurement period (see above), or additional assets or liabilities are recognized, to reflect new information obtained about facts and circumstances that existed at the acquisition date that, if known, would have affected the amounts recognized at that date.

After initial recognition, goodwill is measured at cost less any accumulated impairment losses.

In a business combination achieved in stages, the acquirer shall remeasure its previously held equity interest in the acquiree at its acquisition-date fair value and recognize the resulting gain or loss, if any, in profit or loss or other comprehensive income, as appropriate. In prior reporting periods, the acquirer may have recognized changes in the value of its equity interest in the acquiree in other comprehensive income. If so, the amount that was recognized in other comprehensive income shall be recognized on the same basis as would be required if the acquirer had disposed directly of the previously held equity interest.

### Foreign currency translation

Monetary assets and liabilities of the Canadian corporations denominated in foreign currencies are translated at the exchange rate in effect at the statements of financial position date, whereas other assets and liabilities are translated at the exchange rate in effect at the transaction date. Revenues and expenses are translated at the exchange rate at the date of the transaction, with the exception of revenues and expenses relating to non-monetary assets and liabilities, which are translated at historical rate. Exchange gains and losses are reflected in the consolidated statements of earnings (loss).

The assets and liabilities of the foreign subsidiaries are translated into Canadian dollars using exchange rates prevailing at the end of the reporting period. Income and expense items are translated at the average exchange rates for the period, unless exchange rates fluctuate significantly during that period, in which case the exchange rates at the dates of the transactions are used. Exchange differences arising, if any, are recognized in other comprehensive income (loss) and accumulated in equity under the heading of currency translation adjustment.

Goodwill and fair value adjustments arising on the acquisition of a foreign operation are treated as assets and liabilities of the foreign operation and are translated at the rate prevailing at the end of each reporting period. Exchange differences arising are recognized in other comprehensive income (loss).

### Fair value measurement

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.

Management reviews significant unobservable inputs and valuation adjustment. If third party information is used to measure fair values, management assesses the evidences obtained from the third parties to support the conclusion that such valuations meet the requirements of IFRS, including the level in the fair value hierarchy in which such valuations should be classified.

When measuring the fair value of an asset or a liability, the Corporation uses market observable data as far as possible. Fair values are categorized into different levels in a fair value hierarchy based on the inputs used in the valuation techniques as follows:

- Level 1: quoted prices (unadjusted) in active markets for identical assets and liabilities that the Corporation can access at the measurement date.
- Level 2: inputs other than quoted prices included in Level 1 that are observable for the asset or liability, either directly or indirectly.
- Level 3: inputs for the asset or liability that are not based on observable market data.

The Corporation recognizes transfers between levels of the fair value hierarchy at the end of the reporting period during which that change has occurred.

Further information about the assumptions made in measuring fair values is included in the notes to the consolidated financial statements.

### Cash

Cash includes cash and demand deposits.

### Inventories

Inventories are valued at the lower of cost and net realizable value. Cost incurred in bringing each product to its present location and condition are accounted for, as follows:

- Raw materials: purchases cost using the weighted average cost method;
- Finished products and work in progress: cost of direct materials and labour and a proportion of manufacturing overheads based on the normal operating capacity but excluding borrowing costs.

Net realizable value is the estimated selling price in the ordinary course of business, less estimated completion costs necessary to make the sale.

### Government assistance

Government assistance, consisting of grants and refundable tax credits, are recorded as a reduction of the related qualifying expenses, in the period the expenses are incurred, when there is reasonable assurance that the Corporation has met or will meet the requirements of the approved grant or refundable tax credit program, based on management's interpretation of applicable legislation.

**Leases**

***Corporation as a Lessee***

*Right-of-Use Assets*

Right-of-use assets are measured at cost. The cost is based on the initial amount of the lease liability plus initial direct costs incurred and estimate of costs to dismantle and remove the underlying asset or to restore the underlying asset or the site on which it is located adjusted for any lease payments made at or before the commencement date, less any lease incentives received, if any.

The cost of right-of-use assets are periodically reduced by depreciation expenses and impairment losses, if any, and adjusted for certain remeasurements of the lease liability. Right-of-use assets are amortized over the lesser of the useful life or the lease term using the straight-line method as this reflects the expected pattern of consumption of the future economic benefits. The lease term includes renewal options only if the Corporation is reasonably certain to exercise the options. Lease terms range from 1 to 19 years for buildings, 3 to 5 years for automotive equipment and 3 to 10 years for machinery and equipment.

*Lease Liabilities*

At the commencement date of the lease, the Corporation recognizes lease liabilities measured at the present value of lease payments to be made over the lease term. Lease payments mainly include fixed payments less any lease incentives receivable and the exercise price of a purchase option reasonably certain to be exercised. Variable lease payments that do not depend on an index or a rate are recognized as an expense in the period during which the event or condition that triggers the payment occurs.

In calculating the present value of lease payments, the Corporation uses the incremental borrowing rate at the lease commencement date if the interest rate implicit in the lease is not readily determinable. After the commencement date, the amount of lease liabilities is increased to reflect accretion of interest and reduced for lease payments made. In addition, the carrying amount of lease liabilities is remeasured if there is a modification, a change in the lease term, a change in the in-substance fixed lease payments or a change in the assessment of whether the underlying asset will be purchased.

*Short-term leases and leases of low-value assets*

The Corporation applies the short-term lease recognition exemption to leases that have a lease term of 12 months or less from the commencement date and do not contain a purchase option. It also applies the recognition exemption for leases that are considered of low value. Lease payments on short-term leases and leases of low-value assets are recognized as an expense on a straight-line basis over the lease term.

*Determining the lease term of contracts with renewal options*

The Corporation determines the lease term as the non-cancellable term of the lease, together with any periods covered by an option to extend the lease if it is reasonably certain to be exercised, or any periods covered by an option to terminate the lease, if it is reasonably certain not to be exercised.

After the commencement date, the Corporation reassesses the lease term if there is a significant event or change in circumstances that is within its control and affects its ability to exercise (or not to exercise) the option to renew (e.g., a change in business strategy).

***Corporation as a Lessor***

Leases in which the Corporation does not transfer substantially all the risks and rewards incidental to ownership of an asset are classified as operating leases. Rental income arising is accounted for on a straight-line basis over the lease terms and is included in revenue in the consolidated statements of earnings or loss due to its operating nature. Initial direct costs incurred in negotiating and arranging an operating lease are added to the carrying amount of the leased asset and recognized over the lease term on the same basis as rental income. Contingent rents are recognized as revenue in the period in which they are earned.

## NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
## (in thousands of Canadian dollars, except per share data)

### Property, plant and equipment

All property, plant and equipment are shown at cost, net of accumulated depreciation and accumulated impairment losses, if any. Such cost includes expenditures that are attributable to the acquisition of the items. Depreciation on assets is calculated using the straight-line method to allocate the cost of each asset less its residual value over its estimated useful economic life. Land is not depreciated. For the buildings, component depreciation accounting is also used for components that have different useful economic life. For mobile water treatment systems, when the Corporation is responsible for major maintenance and overhauls, the actual overhaul cost is capitalized and depreciated over the estimated useful life of the overhaul. Depreciation is calculated over the following periods:

| | |
|---|---|
| Buildings | 10-26 years |
| Machinery and equipment | 2-15 years |
| Furniture, office and computer equipment | 2-10 years |
| Automotive equipment | 3-7 years |
| Containerized units | 4-10 years |
| Mobile water treatment systems | 5–10 years |
| Leasehold improvements | remaining term of the lease between one and ten years |

The depreciation expense is included as “Depreciation of property, plant and equipment and right-of-use assets” in the consolidated statements of earnings (loss).

When significant parts of plant and equipment are required to be replaced at intervals, the Corporation depreciates them separately based on their specific useful lives. Likewise, when a major inspection is performed, its cost is recognized in the carrying amount of the plant and equipment as a replacement if the recognition criteria are satisfied. All other repair and maintenance costs are recognized in the consolidated statements of earnings (loss) as incurred.

The estimated useful lives, residual values and depreciation methods are reviewed at each reporting period end, with the effect of any changes in estimate accounted for on a prospective basis.

The gain or loss arising on the disposal or retirement of an item of property, plant and equipment is determined as the difference between the sales proceeds and the carrying amount of the asset and is recognized in the consolidated statements of earnings (loss).

### Intangible assets

Intangible assets acquired separately are measured on initial recognition at cost. The cost of intangible assets acquired in a business combination is their fair value at the date of acquisition. Following initial recognition, intangible assets are carried at cost less any accumulated amortization and accumulated impairment losses. Internally generated intangibles, excluding capitalized development costs, are not capitalized and the related expenditure is reflected in the consolidated statements of earnings (loss) in the period in which the expenditure is incurred.

Intangible assets with finite lives are amortized over their estimated useful economic life and assessed for impairment whenever there is an indication that the intangible asset may be impaired. The amortization period and the amortization method for an intangible asset with a finite useful life are reviewed at least at the end of each reporting period. The amortization expense is included in the consolidated statements of earnings (loss) as “Amortization of intangible assets”.

Intangible assets with indefinite useful lives are not amortized, but are tested for impairment annually, either individually or at the cash-generating unit-level. The assessment of indefinite life is also reviewed on an annual basis to determine whether the indefinite life continues to be supportable. If not, the change in useful life from indefinite to finite is made on a prospective basis.

The Corporation is using the following amortization methods:

*Intangible assets acquired separately*

- Software is amortized using the straight-line method over a period of 1 or 10 years.

*Intangible assets acquired in business combinations*

- Intellectual property includes the patents, the rights on technologies, technologies and the technical drawings. Intellectual properties and patents are amortized using the straight-line method over a period of 7 to 20 years.
- Technical drawings are amortized using the straight-line method over a period of 10 years.
- Trademarks with a definite useful life are amortized using the straight-line method over a period of 7 years.
- Customer relations are amortized using the straight-line method over periods of 5 and 15 years.
- Non-compete agreements are amortized using the straight-line method over a period of 10 years.
- Contractual agreements are amortized over the related contract length.
- Distribution network is amortized using the straight-line method over a period of 5 years.

*Research and development costs*

Research costs are expensed as incurred. Development expenditures on an individual project are recognized as an intangible asset when the Corporation can demonstrate:

- The technical feasibility of completing the intangible asset so that the asset will be available for use or sale;
- Its intention to complete and its ability and intention to use or sell the asset;
- How the asset will generate future economic benefits;
- The availability of resources to complete the asset;
- The ability to measure reliably the expenditure during development.

Following initial recognition of the development expenditure as an asset, the asset is carried at cost less any accumulated amortization and accumulated impairment losses. Amortization of the asset begins when development is complete, and the asset is available for use. It is amortized over a maximum period of 5 years on a straight-line basis.

### Impairment of long-lived assets

At the end of each reporting period, the Corporation reviews the carrying amounts of its long-lived assets (which includes property, plant and equipment, right-use-assets and intangible assets) with finite useful lives to determine whether there is any indication that those assets have suffered an impairment loss. If any such indication exists, the recoverable amount of the asset is estimated in order to determine the extent of the impairment loss (if any). For the purposes of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash flows (cash-generating units). When it is not possible to estimate the recoverable amount of an individual asset, the Corporation estimates the recoverable amount of the cash-generating unit to which the asset belongs. When a reasonable and consistent basis of allocation can be identified, corporate assets are also allocated to individual cash-generating units, or otherwise they are allocated to the smallest group of cash-generating units for which a reasonable and consistent allocation can be identified.

Intangible assets with indefinite useful lives and intangible assets not yet available for use are tested for impairment at least annually, and whenever there is an indication that the asset may be impaired.

Recoverable amount is the higher of fair value less costs of disposal and value in use. In determining fair value less cost to sell, recent market transactions are taken into account. Costs of disposal are the incremental costs directly attributable to the disposal of an asset, excluding finance costs and income tax expense. In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset for which the estimates of future cash flows have not been adjusted.

If the recoverable amount of an asset (or cash-generating unit) is estimated to be less than its carrying amount, the carrying amount of the asset (or cash-generating unit) is reduced to its recoverable amount. An impairment loss is recognized immediately in the consolidated statements of earnings (loss).

For assets excluding goodwill, a previously recognized impairment loss is reversed only if there has been a change in the assumptions used to determine the asset's recoverable amount since the last impairment loss was recognized.

Where an impairment loss on assets with definite useful life subsequently reverses, the carrying amount of the asset (or cash-generating unit) is increased to the revised estimate of its recoverable amount, but so that the increased carrying amount does not exceed the carrying amount that would have been determined had no impairment loss been recognized for the asset (or cash-generating unit) in prior years. A reversal of an impairment loss is recognized immediately in the consolidated statements of earnings (loss).

### Impairment of goodwill

For the purpose of impairment testing, goodwill acquired in a business combination is, from the acquisition date, allocated to each cash-generating unit ("CGU") that are expected to benefit from the combination, irrespective of whether other assets or liabilities of the acquiree are assigned to those units. CGUs to which goodwill has been allocated are tested for impairment annually, or more frequently when there is an indication that the unit may be impaired. If the recoverable amount of the CGU is less than its carrying amount, the impairment loss is allocated first to reduce the carrying amount of any goodwill allocated to the unit and then to the other assets of the unit pro-rata basis of the carrying amount of each asset in the unit. An impairment loss recognized for goodwill is not reversed in a subsequent period. On disposal of a subsidiary, the attributable amount of goodwill is included in the determination of the gain or loss on disposal.

Where goodwill has been allocated to a CGU and part of the operation within that unit is disposed of, the goodwill associated with the disposed operation is included in the carrying amount of the operation when determining the gain or loss on disposal. Goodwill disposed in these circumstances is measured based on the relative values of the disposed operation and the portion of the CGU retained.

The Corporation has elected to perform its annual impairment test of goodwill as of April 1st of each year.

### Financial instruments – initial recognition and subsequent measurement

Classification and measurement

All financial assets and liabilities are recognized initially at fair value, in the case of financial instruments not at fair value through profit and loss ("FVTPL"), plus transaction costs.

Debt financial instruments are subsequently measured at FVTPL, fair value through other comprehensive income ("FVOCI"), or amortized cost using the effective interest rate method. The Corporation determines the classification of its financial assets based on the Corporation's business model for managing the financial assets and whether the instruments' contractual cash flows represent solely payments of principal and interest on the principal amount outstanding. The Corporation's derivatives not designated as a hedging instrument in a qualifying hedge relationship are subsequently measured at FVTPL. Equity instruments within the scope of IFRS 9, if any, are subsequently measured at FVTPL or elected irrevocably to be classified at FVOCI at initial recognition.

Financial liabilities are subsequently measured at amortized cost using the effective interest method or at FVTPL. Financial liabilities are subsequently measured as FVTPL when the financial liability is: (i) contingent consideration of an acquirer in a business combination; (ii) held for trading; or (iii) it is designated as FVTPL if eligible. Other financial liabilities are subsequently measured at amortized cost using the effective interest method.

For financial liabilities that are designated as FVTPL, the amount of change in the fair value of the financial liability that is attributable to changes in the Corporation's own credit risk of that liability is recognized in OCI unless the recognition of the effects of changes in the liability's credit risk in OCI would create or enlarge an accounting mismatch in the consolidated statements of earnings (loss) and comprehensive earnings (loss). The remaining amount of change in the fair value of liability is recognized in the consolidated statements of earnings (loss). Changes in fair value of a financial liability attributable to the Corporation's own credit risk that are recognized in OCI are not subsequently reclassified to the consolidated statements of earnings (loss); instead, they are transferred to deficit, upon derecognition of the financial liability.

The Corporation has made the following financial instrument classifications:

| Financial Instrument | IFRS 9 Measurement |
|---|---|
| Cash | Amortized cost |
| Accounts receivable | Amortized cost |
| Other assets | Amortized cost |
| Related party loans receivable | Amortized cost |
| Bank loans | Amortized cost |
| Accounts payable and accrued liabilities | Amortized cost |
| Long-term debt | Amortized cost |
| Contingent considerations | FVTPL |
| Other non-current financial liabilities | Amortized cost |

Impairment

IFRS 9 requires a forward-looking Expected Credit Loss ("ECL") model. ECLs are based on the difference between the contractual cash flows due in accordance with the contract and all the cash flows that the Corporation expects to receive.

For accounts receivable and contract assets, the Corporation elected to use the simplified approach and assessed the impact of the standard based on lifetime expected credit losses. The Corporation has established a provision that is based on the Corporation's historical credit loss experience, adjusted for forward-looking factors specific to the customer and the economic environment.

For related party loans receivable, the allowance for credit loss ("ACL") is based on the 12-month ECL, referred to as the general approach under IFRS 9. The 12-month ECL is the portion of lifetime ECLs that results from default events on a financial instrument that are possible within 12 months after the reporting date. However, when there has been a significant increase in credit risk since origination, the allowance will be based on the lifetime ECL.

The Corporation considers a financial asset to be in default when internal or external information indicates that the Corporation is unlikely to receive the outstanding contractual amounts in full before taking into account any credit risk mitigated by Export Development Canada's ("EDC") insurance for some of the accounts receivable.

Derecognition

A financial asset is derecognized when the rights to receive cash flows from the asset have expired, or the Corporation has transferred its rights to receive cash flows from the asset and either (a) the Corporation has transferred substantially all the risks and rewards of the asset, or (b) the Corporation has neither transferred nor retained substantially all the risks and rewards of the asset, but has transferred control of the asset.

A financial liability is derecognized when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability are substantially modified, such an exchange or modification is treated as a derecognition of the original liability and the recognition of a new liability. The difference in the respective carrying amounts is recognized in the consolidated statements of comprehensive earnings.

Derivative financial instruments and hedge accounting

The Corporation uses derivative financial instruments, such as interest rate swaps, to hedge its interest rate risks. Such derivative financial instruments are initially recognized at fair value on the date on which a derivative contract is entered

into and are subsequently remeasured at fair value. Derivatives are carried as financial assets when the fair value is positive and as financial liabilities when the fair value is negative.

Any gains or losses arising from changes in the fair value of derivatives are taken directly to consolidated statements of earnings (loss), except for the effective portion of cash flow hedges, which is recognized in OCI and later reclassified to consolidated statements of earnings (loss) when the hedge item affects profit or loss.

For the purpose of hedge accounting, hedges are classified as:

- Fair value hedges when hedging the exposure to changes in the fair value of a recognized asset or liability or an unrecognized firm commitment.
- Cash flow hedges when hedging the exposure to variability in cash flows that is either attributable to a particular risk associated with a recognized asset or liability or a highly probable forecast transaction or the foreign currency risk in an unrecognized firm commitment.
- Hedges of a net investment in a foreign location.

At the inception of a hedge relationship, the Corporation formally designates and documents the hedge relationship to which it wishes to apply hedge accounting and the risk management objective and strategy for undertaking the hedge. The documentation includes identification of the hedging instrument, the hedged item or transaction, the nature of the risk being hedged and how the entity will assess the effectiveness of changes in the hedging instrument's fair value in offsetting the exposure to changes in the hedged item's fair value or cash flows attributable to the hedged risk. Such hedges are expected to be highly effective in achieving offsetting changes in fair value or cash flows and are assessed on an ongoing basis to determine that they actually have been highly effective throughout the financial reporting periods for which they were designated.

The Corporation has only elected to designate hedging relationships with regards to interest rate swap contracts to mitigate the interest rate risk variation on long-term debt. As at June 30, 2023, the Corporation had no interest rate swap contracts.

*Cash flow hedges*

The effective portion of the gain or loss on the hedging instrument is recognized in OCI in the cash flow hedge reserve, while any ineffective portion is recognized immediately in the consolidated statements of earnings (loss). The cash flow hedge reserve is adjusted to the lower of the cumulative gain or loss on the hedging instrument and the cumulative change in fair value of the hedged item.

The Corporation uses interest rate swap contracts as hedges of its exposure to interest rate risk in forecast transactions and firm commitments. The ineffective portion relating to interest rate swap contracts is recognized in the consolidated statements of earnings (loss).

The Corporation designates only the spot element of forward contracts as a hedging instrument. The forward element is recognized in OCI and accumulated in a separate component of equity under cost of hedging reserve.

The amounts accumulated in OCI are accounted for, depending on the nature of the underlying hedged transaction. If the hedged transaction subsequently results in the recognition of a non-financial item, the amount accumulated in equity is removed from the separate component of equity and included in the initial cost or other carrying amount of the hedged asset or liability. This is not a reclassification adjustment and will not be recognized in OCI for the period. This also applies where the hedged forecast transaction of a non-financial asset or non-financial liability subsequently becomes a firm commitment for which fair value hedge accounting is applied.

For any other cash flow hedges, the amount accumulated in OCI is reclassified to the consolidated statements of earnings (loss) as a reclassification adjustment in the same period or periods during which the hedged cash flows affect the consolidated statements of earnings (loss). If cash flow hedge accounting is discontinued, the amount that has been accumulated in OCI must remain in accumulated OCI if the hedged future cash flows are still expected to occur. Otherwise, the amount will be immediately reclassified to the consolidated statements of earnings (loss) as a reclassification adjustment. After discontinuation, once the hedged cash flow occurs, any amount remaining in accumulated OCI must be accounted for depending on the nature of the underlying transaction as described above.

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

**Revenue recognition**

Revenue from contracts with customers is recognized, for each performance obligation, either over a period of time or at a point in time, depending on which method reflects the transfer of control of the goods or services underlying the particular performance obligation to the customer.

*Project contracts*
In most cases, for performance obligations satisfied over time, the Corporation recognizes revenue over time using an input method, based on costs incurred to date relative to total estimated costs at completion, to measure progress toward satisfying such performance obligations. Under this method, costs that do not contribute to the performance of the Corporation in transferring control of goods or services to the customer are excluded from the measurement of progress toward satisfying the performance obligation. In certain other situations, the Corporation might recognize revenue at a point in time, when the criteria to recognize revenue over time are not met. In any event, when the total anticipated costs exceed the total anticipated revenues on a contract, such loss is recognized in its entirety in the period it becomes known.

The Corporation accounts for a contract modification, which consists of a change in the scope or price (or both) of a contract, as a separate contract when the remaining goods or services to be delivered after the modification are distinct from those delivered prior to the modification and the price of the contract increases by an amount of consideration that reflects the Corporation's stand-alone selling price of the additional promised good or services. When the contract modification is not accounted for as a separate contract, the Corporation recognizes an adjustment to revenue on a cumulative catch-up basis at the date of contract modification.

As a significant portion of the Corporation's revenues are recognized over time, the contractual terms which determine when consideration becomes receivable from the customer, such as upon the achievement of certain milestones, the Corporation's reaching such milestones earlier or later than anticipated and the ability to obtain down payments on contracts will influence, among other factors, the balance of trade receivables, contract assets and contract liabilities on a given contract.

A contract asset is initially recognized for revenue earned from services performed under its design and manufacturing contracts because the receipt of consideration is conditional to certain terms of the contract. Upon completion of the services and acceptance by the customer, the amount recognized as contract assets is reclassified to trade accounts receivable.

A contract liability is recognized if a payment is received or a payment is due (whichever is earlier) from a customer before the Corporation transfers the related goods or services. Contract liabilities are recognized as revenue when the Corporation performs under the contract (i.e., transfers control of the related goods or services to the customer).

If the Corporation has a contract that is onerous, the present obligation under the contract is recognized and measured as a provision. However, before a separate provision for an onerous contract is established, the Corporation recognizes any impairment loss that has occurred on assets dedicated to that contract.

*Sales of specialty products and services activities*
For Specialty Products and services activities, revenue is recognized at the point in time when control of the asset is transferred to the customer, either at FOB shipping or FOB destination. The Corporation generally has a right to payment at the time of delivery (which is the same time that the Corporation has satisfied its performance obligations under the arrangement), as such a receivable is recognized as the consideration is unconditional and only the passage of time is required before payment is due.

Revenues from services activities consist of the number of labour hours required to repair water treatment system to which a billing rate per hour is applied and is recognized at a point time.

The Corporation may provide discounts and sales promotional incentives to its customers, which give rise to variable consideration. The variable consideration is constrained to the extent that it is highly probable that a significant reversal in the amount of cumulative revenue recognized will not occur when any uncertainty is subsequently resolved. The application of the constraint on variable consideration increases the amount of revenue that will be deferred. The Corporation applies the most likely estimated discount to be provided to customers using contracted rates and estimating volume rebates provided to customers based on historical spending patterns. Consequently, revenues are recognized net of these estimated promotional incentives.

In subsequent periods, the Corporation monitors the performance of customers against agreed-upon obligations related to sales incentive programs and makes any adjustments to both revenue and sales incentive accruals as required.

*Operation and maintenance revenue*
Revenues consist of operator contracts, which include utility management, maintenance services, management of employees, and other miscellaneous services specific to the contract. The contracts are long-term with billings occurring monthly based on one-twelfth of the annual service fee as outlined in the contract, and revenues are recognized over time. Repairs, installation, and other services outside the scope of the services, as outlined in the contract, and amounts above the budgeted costs are billed at cost to the customer and recognized as they occur.

The amount of revenue recognized by the Corporation is based on the transaction price allocated to each performance obligation. Such transaction price corresponds to the amount of consideration to which the Corporation expects to be entitled in exchange for transferring promised goods or services to a customer, excluding amounts collected on behalf of third parties. The transaction price includes, among other things and when applicable, an estimate of variable consideration only to the extent that it is highly probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved. Variable consideration is usually derived from incentives and volume rebates.

### Interest income

Interest income is recognized when it is probable that the economic benefits will flow to the Corporation and the amount of revenue can be measured reliably using the effective interest rate applicable. Interest income is included in the finance income in the consolidated statements of earnings or loss.

### Share capital

Common shares are classified as equity. Incremental costs that are directly attributable to the issuance of common shares and stock options are recognized as a deduction from equity, net of any tax effects.

### Share-based payment

The Corporation offers a stock option plan to directors, executive officers, key employees and consultants providing services to the Corporation and accounts for these awards in accordance with *IFRS 2, Share-based Payment*. Stock options granted to directors, executive officers, key employees and consultants providing services are measured at fair value (excluding the effect of non-market-based vesting conditions) at the date of grant. Details regarding determination of the fair value of equity-settled share-based transactions are set out in Note 18 – *Capital Stock*.

The fair value at the grant date of stock options is determined using the Black-Scholes pricing model and is recognized in the consolidated statements of earnings (loss) as a compensation expense using a graded vesting schedule over the vesting period, based on the Corporation's estimate of the number of shares that will eventually vest. At the end of each reporting period, the Corporation revises its estimate of the number of equity instruments expected to vest. The impact of the revision of original estimates, if any, is recognized in the consolidated statements of earnings (loss) such that the cumulative compensation expense reflects the revised estimate, with a corresponding adjustment to the Reserve – stock option.

Any consideration received by the Corporation upon the exercise of stock options is credited to share capital, and the Reserve – stock option component resulting from share-based payment is transferred to share capital upon the issuance of the shares.

### Warrants

Proceeds from the issue of warrants treated as equity are recorded as a separate component of equity. Costs incurred on the issue of warrants are netted against proceeds. Warrants issued with common shares are measured at fair value at the date of issue using the Black-Scholes pricing model, which incorporates certain input assumptions including the warrant price, risk-free interest rate, expected warrant life and expected share price volatility. The fair value is included as a component of equity and is transferred from warrants to common shares on exercise.

### Taxation

Income tax expense represents the sum of the current and deferred tax. Tax is recognized in the consolidated statements of earnings (loss), except to the extent it relates to items recognized directly in equity, in which case the related tax is recognized in equity.

*Current tax*
Current tax assets or current tax liabilities represent the taxation authorities' obligations or claims for prior or current periods which are not received or paid at the statement of financial position date. Current tax is based on taxable profit which differs from accounting profit. Current tax liabilities are measured using tax rates that have been enacted or substantively enacted at the statements of financial position date.

*Deferred tax*
Deferred tax is accounted for using a temporary difference approach and is the tax expected to be payable or recoverable on temporary differences between the carrying amount of assets and liabilities in the consolidated statements of financial position and the corresponding tax bases on the expected manner of realisation or settlement of the carrying amount of assets and liabilities, using tax rates and laws enacted or substantively enacted at the statements of financial position date.

Deferred tax liabilities are generally recognized for all taxable temporary differences. Deferred tax liabilities are recognized for taxable temporary differences arising on investments in subsidiaries and joint ventures except where the reversal of the temporary difference can be controlled and it is probable that the difference will not reverse in the foreseeable future.

Deferred tax assets are recognized for all deductible temporary differences, the carry forward of unused tax credits and any unused tax losses. Deferred tax assets are recognized to the extent that it is probable that taxable profit will be available against which the deductible temporary differences, and the carry forward of unused tax credits and unused tax losses can be utilised, except:

- When the deferred tax asset relating to the deductible temporary difference arises from the initial recognition of an asset or liability in a transaction that is not a business combination and, at the time of the transaction, affects neither the accounting profit nor taxable profit or loss;
- In respect of deductible temporary differences associated with investments in subsidiaries, associates and interests in joint arrangements, deferred tax assets are recognized only to the extent that it is probable that the temporary differences will reverse in the foreseeable future and taxable profit will be available against which the temporary differences can be utilised.

The carrying amount of deferred tax assets is reviewed at each reporting date and reduced to the extent that it is no longer probable that sufficient taxable profit will be available to allow all or part of the deferred tax asset to be utilised. Unrecognized deferred tax assets are re-assessed at each reporting date and are recognized to the extent that it has become probable that future taxable profits will allow the deferred tax asset to be recovered.

Deferred tax liabilities are not recognized on temporary differences that arise from goodwill which is not deductible for tax purposes. Deferred tax assets and liabilities are not recognized in respect of temporary differences that arise on initial recognition of assets and liabilities acquired other than in a business combination.

Deferred tax assets and liabilities are offset when there is a legally enforceable right to offset current tax assets against current tax liabilities and when the deferred tax assets and liabilities relate to income taxes levied by the same taxation authority on either the same taxable entity or different taxable entities where there is an intention to settle the balances on a net basis.

### Segment reporting

Operating segments are reported in a manner consistent with the internal reporting provided to the chief operating decision-maker ("CODM"). The CODM who is responsible for allocating resources and assessing performance of the operating segments has been identified as the chief executive officer who makes strategic decisions.

As required by the CODM, the Corporation operates under three financial reporting segments: i) water technologies and services ("WTS"); ii) specialty products, including a complete line of maple equipment and products, specialty chemicals, consumables, and specialized products for the water treatment industry (couplings and cartridge filters) ("Specialty Products"); and iii) operation and maintenance services for water and wastewater treatment systems ("O&M").

### Net earnings (loss) per share

Basic net earnings (loss) per common share are computed by dividing the net earnings (loss) available to common shareholders by the weighted average number of common shares outstanding during the year. Diluted earnings per share are calculated giving effect to the potential dilution that could occur if the stock options and warrants to issue common shares were exercised at the later of the beginning of the year or the issuance date. The treasury stock method is used to determine the dilutive effect of stock options.

### Provisions

Provisions are recognized when the Corporation has a present obligation (legal or constructive) as a result of a past event, it is probable that the Corporation will be required to settle the obligation, and a reliable estimate can be made of the amount of the obligation.

The amount recognized as a provision is the best estimate of the consideration required to settle the present obligation at the end of the reporting period, taking into account the risks and uncertainties surrounding the obligation. Where a provision is measured using the cash flows estimated to settle the present obligation, its carrying amount is the present value of those cash flows.

When some or all of the economic benefits required to settle a provision are expected to be recovered from a third party, a receivable is recognized as an asset if it is virtually certain that reimbursement will be received and the amount of the receivable can be measured reliably.

### Warranties

The provision for warranty claims represents the present value of the management's best estimate of the future outflow of economic benefits that will be required under the Corporation's obligations for warranties as required by law. The estimate has been made on the basis of historical warranty trends and may vary as a result of new materials, duration of warranties provided by suppliers, altered manufacturing processes or other events affecting product quality. The warranty provisions are accounted as liability under Provisions.

The Corporation offers warranties that are of variable lengths of time depending on each customer agreements.

### New standards, interpretations and amendments adopted

The Corporation applied for the first-time the following standards and amendments, which are effective for annual period beginning on or after July 1, 2022:

- Reference to Conceptual Framework (Amendments to IFRS 3): The amendments update the reference to Conceptual Framework and adds an exception to its requirement for an entity to refer to the Conceptual Framework to determine what constitutes an asset of a liability.
- Onerous contracts – Cost if Fulfilling a Contract (Amendments to IAS 37): The Amendments clarify that for the purpose of assessing whether a contract is onerous, the cost of fulfilling the contract includes both the incremental costs of fulfilling that contract and an allocation of other costs that relate directly to fulfilling the contract.
- Property, Plant and Equipment: Proceeds before Intended Use (Amendments to IAS 16): The amendment prohibits entities from deducting cost of an item of property, plant and equipment, any proceeds from selling items produced while bringing that asset to the location and condition necessary for it to be capable of operating in the manner intended by management. Instead, an entity recognizes the proceeds from selling such items, and the costs of producing those items, in profit or loss.
- Financial Instruments (Annual Improvement to IFRS 9): The improvements clarify that in applying the "10 percent" test to assess whether to derecognize a financial liability, an entity includes only fees paid or received between the entity (the borrower) and the lender, including fees paid or received by either the entity or the lender on the other's behalf.

These amendments had no impact on the consolidated financial statements. The Corporation has not early adopted any other standard, interpretation or amendment that has been issued but is not yet effective.

## 3. Critical accounting estimates, assumptions and judgements

The preparation of consolidated financial statements in accordance with IFRS often requires management to make estimates about and apply assumptions or subjective judgment to future events or other matters that affect the reported amounts of the Corporation's assets, liabilities, revenues, expenses and related disclosures. Assumptions, estimates and judgments are based on historical experience, expectations, current trends and other factors that management believes to be relevant at the time at which the Corporation's consolidated financial statements are prepared. Management reviews, on a regular basis, the Corporation's accounting policies, assumptions, estimates and judgments in order to ensure that the consolidated financial statements are presented fairly in accordance with IFRS.

Critical accounting estimates and judgments are those that have a significant risk of causing material adjustment and are often applied to matters or outcomes that are inherently uncertain and subject to change. As such, management cautions that future events often vary from forecasts and expectations and that estimates routinely require adjustment.

Management considers the following areas to be those where critical accounting policies affect the significant judgments and estimates used in the preparation of the Corporation's consolidated financial statements.

### Estimates and assumptions

*Revenue recognition of Projects*
The stage of completion of any project contract is assessed by management by taking into consideration all information available at the reporting date and through the date prior to the financial statements being available for release. In this process, management applies significant estimates about percentage-of-completion and the estimated costs to be incurred to complete work.

*Impairment of goodwill*
Goodwill is tested for impairment at least annually, and whenever there is an indication that the asset may be impaired. The recoverable amount is the higher of its fair value less costs to sell and its value in use. Determining whether goodwill is impaired requires an estimation of the value in use of the CGU or group of CGU to which the goodwill has been allocated. The value in use calculation requires management to estimate future pre-tax discounted cash flows expected to arise from the CGU or group of CGU and a suitable discount rate in order to calculate present value. The key assumptions required for the value in use estimation are the revenue growth rates and the earnings before interest, taxes, depreciation, and

amortization ("EBITDA") margin and the discount rate. Cash flows for each CGU are derived from the budget prepared by management and approved on an annual basis by the members of the Board of Directors, and are the primary sources for determining the value in use.

For impairment purposes, determination of CGUs is based on management's best estimate of what constitutes the lowest level at which an asset or group of assets is able to generate cash inflows. The Corporation must also determine whether goodwill can be attributed to one or more CGUs.

The key assumptions used to determine the recoverable amount for the different CGUs, including a sensitivity analysis, are disclosed and further explained in note 11. Those estimates, including the methodology used, the assessment of CGU's and how goodwill is allocated, can have a material impact on the respective values and ultimately the amount of any goodwill impairment.

*Fair value of customer relationships and goodwill acquired in a business combination*
Under the acquisition method, on the date that control is obtained, the identifiable assets, liabilities and contingent liabilities of the acquired business are measured at their fair values. The Corporation uses appropriate valuation techniques in arriving at the estimated fair value of identifiable intangible assets acquired at the acquisition date and estimating their useful lives. These valuations are generally based on a forecast of the total expected future net discounted cash flows and relate closely to the assumptions made by management regarding the future performance of the related assets and the discount rate applied as it would be assumed by a market participant. Determination of the fair value of the acquired assets and liabilities requires judgment and the use of assumptions that, if changed, may affect the consolidated statements of earnings (loss) and consolidated statements of financial position.

*Deferred tax assets*
Deferred tax assets are recognized for unused tax losses and deductible temporary differences to the extent that it is probable that taxable income will be available against which the losses and deductible temporary differences can be utilized. Management exercises judgment in the assessment of the probability to estimate the extent to which deferred income tax assets can be realized. In making this judgment, management assess forecasts based on the most recent approved budget. Management uses judgement to assess specific facts and circumstances to evaluate legal, economic and other uncertainties.

## 4. Accounting standards and amendments issued but not yet adopted

The following amendments to standards have been issued and are applicable to the Corporation for its annual periods beginning on July 1, 2023 and thereafter, with an earlier application permitted:

*Disclosure of Accounting Policies – Amendments to IAS 1 and IFRS Practice Statement 2*
In February 2021, the IASB issued amendments to IAS 1 and IFRS Practice Statement 2 Making Materiality Judgements, in which it provides guidance and examples to help entities apply materiality judgements to accounting policy disclosures. The amendments aim to help entities provide accounting policy disclosures that are more useful by replacing the requirement for entities to disclose their 'significant' accounting policies with a requirement to disclose their 'material' accounting policies and adding guidance on how entities apply the concept of materiality in making decisions about accounting policy disclosures.

*Definition of Accounting Estimates – Amendments to IAS 8*
In February 2021, the IASB issued amendments to IAS 8, in which it introduces a definition of 'accounting estimates'. The amendments clarify the distinction between changes in accounting estimates and changes in accounting policies and the correction of errors. Also, they clarify how entities use measurement techniques and inputs to develop accounting estimates.

*Deferred Tax related to Assets and Liabilities arising from a Single Transaction – Amendments to IAS 12*
On May 7, 2021, the IASB issued amendments to IAS 12 – Income Taxes to narrow the scope of the initial recognition exemption so that it does not apply to transactions that give rise to equal and offsetting temporary differences. As a result,

companies will be required to recognize a deferred tax asset and a deferred tax liability for temporary differences arising on initial recognition such as a lease and a decommissioning provision.

These amendments are not expected to have a significant impact on the Corporation's consolidated financial statements.

The following amendments will apply for its annual periods beginning on July 1, 2024 and thereafter, with an earlier application permitted:

*Amendments to IAS 1: Classification of Liabilities as Current or Non-current*
In January 2020, the IASB issued amendments to paragraphs 69 to 76 of IAS 1 to specify the requirements for classifying liabilities as current or non-current. The amendment clarify:

- What is meant by a right to defer settlement;
- That a right to defer must exist at the end of the reporting period;
- That classification is unaffected by the likelihood that an entity will exercise its deferral right;
- That only if an embedded derivative in a convertible liability is itself an equity instrument would the terms of a liability not impact its classification.

*Amendments to IAS 1: Non-current Liabilities with Covenants*
In October 2022, the IASB issued amendments which specify that for liability arising from loans arrangements with covenants to be complied with after the reporting date, such covenants do not affect the classification as current or non-current at the reporting date but do require disclosures in the notes to the financial statements.

The Corporation is currently evaluating the impact of adopting these amendments on its consolidated financial statements.

## 5. Business combinations

### A. Acquisition of Leader Evaporator Co., Inc.

On June 30, 2022, the Corporation entered into an asset purchase agreement with Leader Evaporator Co., Inc. ("Leader") to purchase substantially all of the assets of Leader. Leader has been selling maple farming equipment and products for more than 130 years to maple syrup producers located mainly in the United States. The brand is positioned as the perfect combination between tradition and quality. This transaction should allow H2O Innovation to increase its market share in the maple industry, primarily in the United States of America, to solidify its position as manufacturer of maple equipment and products and to expand its manufacturing capabilities with an additional facility of 103,780 sq. ft. located in the Town of Swanton, VT. The effective date of the acquisition is June 30, 2022.

The transaction was financed using the Corporation's available cash and existing credit facilities.

The Corporation has completed its fair value assessment of the assets acquired and of the liabilities assumed. All of the intangible assets acquired are not deductible for tax purposes.

The final estimates of the fair value of assets acquired and liabilities assumed for the acquisition of Leader based on the estimated fair value on the date of acquisition and available information as at the date of the publication of these consolidated financial statements are as follow:

## NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
## (in thousands of Canadian dollars, except per share data)

### Purchase price allocation on acquisition date (June 30, 2022)

| (In thousands of Canadian dollars) | Final allocation |
|---|---|
| | $ |
| **Assets acquired** | |
| Cash | **135** |
| Accounts receivable (1) | **237** |
| Inventory | **3,914** |
| Contract assets | **243** |
| Prepaid expenses | **21** |
| Property, plant and equipment | **1,664** |
| Right-of-use assets (2) | **2,855** |
| **Liabilities assumed** | |
| Long-term debt | **(1,346)** |
| Accounts payable and accrued liabilities | **(4,646)** |
| Contract liabilities | **(1,609)** |
| Lease liabilities (2) | **(2,855)** |
| **Identifiable net tangible assets acquired** | **(1,387)** |
| Intangible assets acquired | |
| Trademark | **759** |
| Customer relationships | **682** |
| Intellectual property | **103** |
| **Fair value of identifiable net assets acquired** | **157** |
| **Consideration** | |
| Cash | **116** |
| **Total consideration payable** | **116** |
| **Bargain purchase gain on acquisition** | **41** |
| Cash consideration paid | **116** |
| Less: Cash acquired | **(135)** |
| **Net cash flow on acquisition** | **(19)** |

(1) The fair value of acquired accounts receivable represents the gross contractual amount for accounts receivable, with no amount of estimated uncollectible amount.

(2) The Corporation measured the acquired lease liabilities using the present value of the remaining lease payments at the date of acquisition. The right-of-use assets were measured at an amount equal to the lease liabilities.

### Costs related to the acquisition

Transaction costs of $192 were expensed and are included in Acquisition and integration costs in the consolidated financial statements in the consolidated statements of earnings (loss).

### Determination of fair value

At the acquisition date, the identifiable assets acquired are recognized at the acquisition-date fair value.

The Corporation's valuation of intangible assets has identified trademark, customer relationships and intellectual property. Significant assumptions used in the determination of intangible assets, as defined by management, are year-over-year revenue growth, discount rate, attrition rate and operating income before depreciation and amortization margin.

Based on management's calculations, the fair value of assets acquired, and liabilities assumed exceeds the amount of consideration transferred resulting in a gain of $41 recognized in other gains and losses in the consolidated statements of earnings (loss) on the acquisition date.

## B. Acquisition of JCO, Inc. and Environmental Consultants, L.L.C.

### Description of the business combination

The Corporation entered into two different share purchase agreements pertaining respectively to the acquisition of all the issued and outstanding shares of JCO, Inc. ("JCO") and of all the membership interest of Environmental Consultants, L.L.C. ("EC"), which offer complete operation, maintenance and management ("O&M") services to municipal and industrial water and wastewater clients from the same region, the Hudson Valley Region in the State of New York. The acquisition of JCO and EC, which were owned and operated separately, complement $H_2O$ Innovation's current business activities in the Northeast United States and solidify its position in the North American O&M market. The effective date of the acquisition is December 15, 2021.

The purchase price for these acquisitions was satisfied from cash on hand, the use of the extended credit facility and by the issuance of an aggregate of 1,107,733 $H_2O$ Innovation's common shares, at a deemed price of $2.375 per share. The fair value of the contingent considerations, which are based on specific revenue level achieved over a period of 12 months, was estimated at $1.7 M (US$1.4 M) using the Corporation's best estimate as at the acquisition date and remeasured as at each reporting date. The purchase price was subject to customary working capital adjustments as of the closing date. The working capital adjustments amounting to $0.3 M (US$0.2 M) was finalized and has been received by the Corporation as at June 30, 2022.

## NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
## (in thousands of Canadian dollars, except per share data)

### Purchase price allocation on acquisition date (December 15, 2021)

| (In thousands of Canadian dollars) | Final Allocation JCO | Final Allocation EC | Final Allocation Total |
|---|---|---|---|
| | $ | $ | $ |
| **Assets acquired** | | | |
| Cash | **487** | **242** | **729** |
| Accounts receivable [1] | **787** | **926** | **1,713** |
| Contract assets | **62** | **177** | **239** |
| Prepaid expenses | **14** | **123** | **137** |
| Property, plant and equipment | **506** | **84** | **590** |
| Right-of-use assets [2] | **74** | **92** | **166** |
| **Liabilities assumed** | | | |
| Accounts payable and accrued liabilities | **(332)** | **(351)** | **(683)** |
| Lease liabilities [2] | **(74)** | **(92)** | **(166)** |
| Contract liabilities | **(399)** | **(60)** | **(459)** |
| Long-term debt | **(480)** | **-** | **(480)** |
| Deferred tax liabilities | **-** | **-** | **-** |
| **Identifiable net tangible assets acquired** | **645** | **1,141** | **1,786** |
| Intangible assets acquired | | | |
| Customer relationships | **11,036** | **6,331** | **17,367** |
| Non-compete agreements | **141** | **-** | **141** |
| Goodwill arising on acquisition | **5,599** | **1,374** | **6,973** |
| **Fair value of identifiable net assets acquired** | **17,421** | **8,846** | **26,267** |
| **Consideration** | | | |
| Cash | | | **22,195** |
| Contingent considerations | | | **1,745** |
| Issuance of common shares | | | **2,641** |
| Working capital adjustment | | | **(314)** |
| **Total consideration payable** | | | **26,267** |
| Cash consideration paid | | | **22,195** |
| Working capital adjustment received | | | **(314)** |
| Less: Cash acquired | | | **(729)** |
| **Net cash flow on acquisition** | | | **21,152** |

(1) The fair value of acquired accounts receivable represents the gross contractual amount for accounts receivable, with no amount of estimated uncollectible amount.

(2) The Corporation measured the acquired lease liabilities using the present value of the remaining lease payments at the date of acquisition. The right-of-use assets were measured at an amount equal to the lease liabilities.

## NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
## (in thousands of Canadian dollars, except per share data)

The purchase price allocation shown above is final and is a summary of the assets acquired, the liabilities assumed and the consideration transferred at fair value as at the acquisition date. It was completed during the fourth quarter of fiscal year 2022. The original transaction was made in U.S. dollars and converted into Canadian dollars as at the acquisition date.

All of the intangible assets and the goodwill acquired are not deductible for tax purposes.

### Costs related to the acquisition

Transaction costs of $252 were expensed and are included in Acquisition and integration costs in the consolidated financial statements in the consolidated statements of earnings (loss). The attributable costs of the issuance of shares of $17 have been charged directly to equity as a reduction in the share capital.

### Determination of fair value

At the acquisition date, the identifiable assets acquired are recognized at the acquisition-date fair value.

The Corporation's valuation of intangible assets has identified customer relationships. Significant assumptions used in the determination of intangible assets, as defined by management, are year-over-year revenue growth, discount rate, attrition rate and operating income before depreciation and amortization margin.

### Goodwill arising from the business combination

Based on management's calculations, an amount of $6,973 of goodwill has been attributed to the transaction and stems essentially from (i) the synergies with the other Corporation's activities, (ii) the economic value of the workforce acquired, and (iii) intangible assets that do not meet the criteria for separate recognition.

### Impact of the business combination on the Corporation's financial performance

The Corporation's net earnings for the year ended June 30, 2022 include $9,803 in revenues and net earnings of $395 generated from JCO and EC additional business.

If the business combination had been completed on July 1 ,2021, the Corporation's consolidated revenues for the year ended June 30, 2022 would have reached $192,063 and consolidated net earnings for the year ended June 30, 2022 would have been $4,780.

The Corporation considers the pro forma figures to be an approximate measurement of the financial performance of the combined business over a twelve-month period. However, pro forma information does not account for synergies or changes to historical transactions and is not necessarily indicative of the profit of the Corporation if the acquisition would have occurred on July 1, 2021, nor the profit that may be achieved in the future.

To determine the Corporation's pro forma consolidated revenues and profit should JCO and EC had been acquired on July 1, 2021, the Corporation has:

- calculated depreciation of property, plant and equipment and amortization of other acquired intangible assets based on the fair value arising from initial recognition of the business combination rather than the carrying amounts recognized in the pre-acquisition financial statements;
- adjusted the financial results from non-recurring expenses related to the previous owner of the Corporation; and
- calculated an additional income tax expense to reflect the pro forma adjustments described above.

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

## 6. Accounts receivable

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | **$** | $ |
| Trade accounts receivable | **32,444** | 31,902 |
| Hold back from customers under manufacturing contracts | **4,028** | 3,806 |
| Allowance for expected credit losses | **(301)** | (196) |
| | **36,171** | 35,512 |
| Other receivables | **458** | 184 |
| | **36,629** | 35,696 |

Trade accounts receivable disclosed above include amounts that are past due at the end of the reporting period for which the Corporation has not recognized an allowance for expected credit losses because there has not been a significant change in credit quality and the amounts are still considered recoverable. In some cases, the Corporation holds the legal right to lien construction projects in the event that certain counterparties do not pay their balance within a specified period of time. The gross amount of accounts receivable for which an allowance for expected credit losses is recorded is $301 ($196 as at June 30, 2022).

(a) Movement in the allowance for expected credit losses

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | **$** | $ |
| Balance at beginning of the year | **(196)** | (220) |
| Impairment losses recognized on receivables | **(122)** | (27) |
| Amounts written off during the year as uncollectible | **26** | 38 |
| Foreign exchange translation | **(9)** | 13 |
| Balance at the end of the year | **(301)** | (196) |

There is no impairment or amount past due other than those related to trade accounts receivable.

## 7. Inventories

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | **$** | $ |
| Raw materials | **5,354** | 5,362 |
| Work in progress | **664** | 525 |
| Finished goods | **14,441** | 14,284 |
| | **20,459** | 20,171 |

As a result of variations in the aging of its inventory of raw materials, the Corporation recognized a provision for obsolete inventory of $447 ($176 in 2022).

## 8. Property, plant and equipment

| Cost | Land and buildings | Machinery and equipment | Furniture, office and computer equipment | Automotive equipment | Mobile water treatment systems | Assets under construction | Leasehold improvements | Total |
|---|---|---|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ | $ | $ | $ |
| Balance as at June 30, 2021 | 1,793 | 3,951 | 1,020 | 3,319 | 686 | - | 828 | **11,597** |
| Additions [a] | - | 5,737 | 353 | 2,721 | 1 | - | 846 | **9,658** |
| Business combinations (note 5) | - | 1,177 | 330 | 747 | - | - | - | **2,254** |
| Disposals and write-offs | - | - | (2) | (111) | - | - | - | **(113)** |
| Effect of foreign currency exchange differences | (11) | 63 | 14 | 148 | 19 | - | 23 | **256** |
| **Balance as at June 30, 2022** | 1,782 | 10,928 | 1,715 | 6,824 | 706 | - | 1,697 | **23,652** |
| Additions [a] | - | 2,413 | 169 | 2,036 | 2,627 | 1,508 | 320 | **9,073** |
| Disposals and write-offs | - | (94) | (5) | (110) | - | - | (13) | **(222)** |
| Effect of foreign currency exchange differences | 14 | 348 | 26 | 179 | (9) | - | 31 | **589** |
| **Balance as at June 30, 2023** | 1,796 | 13,595 | 1,905 | 8,929 | 3,324 | 1,508 | 2,035 | **33,092** |
| **Accumulated depreciation** | | | | | | | | |
| Balance as at June 30, 2021 | (681) | (2,391) | (601) | (1,644) | (91) | - | (532) | **(5,940)** |
| Depreciation expense | (81) | (539) | (236) | (885) | (162) | - | (75) | **(1,978)** |
| Disposals and write-offs | - | - | - | 78 | - | - | - | **78** |
| Effect of foreign currency exchange differences | (1) | (78) | (16) | (74) | (2) | - | (9) | **(180)** |
| **Balance as at June 30, 2022** | (763) | (3,008) | (853) | (2,525) | (255) | - | (616) | **(8,020)** |
| Depreciation expense | (80) | (1,269) | (315) | (1,380) | (389) | - | (194) | **(3,627)** |
| Disposals and write-offs | - | 10 | 5 | 101 | - | - | 13 | **129** |
| Effect of foreign currency exchange differences | (1) | (75) | (7) | (54) | - | - | (6) | **(143)** |
| **Balance as at June 30, 2023** | (844) | (4,342) | (1,170) | (3,858) | (644) | - | (803) | **(11,661)** |
| **Net amount as at June 30, 2022** | **1,019** | **7,920** | **862** | **4,299** | **451** | **-** | **1,081** | **15,632** |
| **Net amount as at June 30, 2023** | **952** | **9,253** | **735** | **5,071** | **2,680** | **1,508** | **1,232** | **21,431** |

(a) The non-cash additions of property and equipment amounted to $0.1 M in the year ended June 30, 2023 ($ 0.2 M as at June 30, 2022).

## 9. Intangible assets

| Cost | Software | Intellectual property | Trademarks | Customer and distributor relations | Contract based agreements | Deferred development costs | Total |
|---|---|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ | $ | $ |
| Balance as at June 30, 2021 | 3,252 | 10,504 | 2,717 | 41,888 | 7,054 | 1,280 | **66,695** |
| Additions | 234 | 16 | - | - | - | 556 | **806** |
| Business combination (note 5) | - | 103 | 759 | 18,049 | 141 | - | **19,052** |
| Effect of foreign currency exchange differences | - | 113 | 70 | 660 | 246 | 7 | **1,096** |
| **Balance as at June 30, 2022** | 3,486 | 10,736 | 3,546 | 60,597 | 7,441 | 1,843 | **87,649** |
| Additions | 468 | - | - | - | - | 561 | **1,029** |
| Disposals and write-offs | - | - | - | - | - | (5) | **(5)** |
| Effect of foreign currency exchange differences | 8 | 43 | 55 | 1,052 | 194 | 5 | **1,357** |
| **Balance as at June 30, 2023** | 3,962 | 10,779 | 3,601 | 61,649 | 7,635 | 2,404 | **90,030** |
| **Accumulated amortization** | | | | | | | |
| Balance as at June 30, 2021 | (1,904) | (9,890) | (1,751) | (14,619) | (4,707) | (693) | **(33,564)** |
| Amortization expense | (262) | (202) | (265) | (3,890) | (645) | (155) | **(5,419)** |
| Effect of foreign currency exchange differences | (5) | (93) | (43) | (352) | (177) | (3) | **(673)** |
| **Balance as at June 30, 2022** | (2,171) | (10,185) | (2,059) | (18,861) | (5,529) | (851) | **(39,656)** |
| Amortization expense | (396) | (214) | (275) | (4,983) | (429) | (131) | **(6,428)** |
| Effect of foreign currency exchange differences | (4) | (42) | (34) | (279) | (142) | (2) | **(503)** |
| **Balance as at June 30, 2023** | (2,571) | (10,441) | (2,368) | (24,124) | (6,100) | (984) | **(46,587)** |
| **Net amount as at June 30, 2022** | **1,315** | **551** | **1,487** | **41,736** | **1,912** | **992** | **47,993** |
| **Net amount as at June 30, 2023** | **1,391** | **338** | **1,233** | **37,526** | **1,535** | **1,420** | **43,443** |

The carrying amount of intangible assets assessed as having an indefinite useful life, which consist of one of the division trademark, is $0.4 M as at June 30, 2023 ($0.4 M as at June 30, 2022).

The Corporation performed its annual impairment test for intangible assets with indefinite useful lives on April 1st 2023 and 2022 in accordance with its policy described in note 2, Summary of significant policies. As a result of the updated management did not identify an impairment.

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

## 10. Right-of-use assets

The following table reconciles the right-of-use assets for the Corporation as of June 30, 2023:

| | Buildings | Automotive equipment | Machinery and equipment | Total |
|---|---|---|---|---|
| | $ | $ | $ | $ |
| **Cost** | | | | |
| Balance as at June 30, 2021 | 11,458 | 708 | 801 | 12,967 |
| Additions | 4,523 | 250 | 32 | 4,805 |
| Business combination (note 5) | 3,021 | - | - | 3,021 |
| Disposals and write-off | - | (46) | - | (46) |
| Effect of changes in exchange rates | (29) | 2 | 3 | (24) |
| Balance as at June 30, 2022 | 18,973 | 914 | 836 | 20,723 |
| **Additions** | **1,208** | **157** | **48** | **1,413** |
| **Disposals and write-off** | **(234)** | **(57)** | **-** | **(291)** |
| **Effect of changes in exchange rates** | **632** | **20** | **3** | **655** |
| **Balance as at June 30, 2023** | **20,579** | **1,034** | **887** | **22,500** |
| | | | | |
| **Accumulated depreciation** | | | | |
| Balance as at June 30, 2021 | (2,298) | (377) | (198) | (2,873) |
| Depreciation expense | (1,571) | (165) | (98) | (1,834) |
| Disposals and write-off | - | 46 | - | 46 |
| Effect of changes in exchange rates | (52) | 4 | (2) | (50) |
| Balance as at June 30, 2022 | (3,921) | (492) | (298) | (4,711) |
| **Depreciation expense** | **(1,901)** | **(202)** | **(84)** | **(2,187)** |
| **Disposals and write-off** | **121** | **57** | **-** | **178** |
| **Effect of changes in exchange rates** | **(84)** | **(11)** | **(2)** | **(97)** |
| **Balance as at June 30, 2023** | **(5,785)** | **(648)** | **(384)** | **(6,817)** |
| Net amount – as at June 30, 2022 | 15,052 | 422 | 538 | 16,012 |
| **Net amount – as at June 30, 2023** | **14,794** | **386** | **503** | **15,683** |

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

## 11. Goodwill

The change in carrying value is as follows:

| | **Total** |
|---|---|
| | **$** |
| Balance as at June 30, 2021 | 30,209 |
| Plus: Business combination – JCO and EC (note 5 b) | 6,973 |
| Effect of foreign exchange differences | 490 |
| Balance as at June 30, 2022 | 37,672 |
| **Effect of foreign exchange differences** | **598** |
| **Balance as at June 30, 2023** | **38,270** |

For the purpose of annual impairment testing, goodwill is allocated to CGU or groups of CGUs, which are the units expected to benefit from the synergies of the business combinations in which the goodwill arises. The Corporation carries out its impairment tests on each CGU or groups of CGUs annually or more frequently if there is an indicator of impairment.

The carrying amount of goodwill allocated to each groups of CGU is as follows:

| | Specialty Products | | O&M | |
|---|---|---|---|---|
| **As at June 30,** | **2023** | 2022 | **2023** | 2022 |
| | **$** | $ | **$** | $ |
| Goodwill | **20,934** | 20,823 | **17,336** | 16,849 |

The Corporation performed its annual impairment test on April 1, 2023 and April 1, 2022. The Corporation considers the relationship between its market capitalisation and its book value, among other factors, when reviewing for indicators of impairment.

*Specialty Products group of CGUs*
The Corporation used the cash-generating unit's value-in-use to determine the recoverable amount, which exceeded the carrying amount. The pre-tax discount rate applied to the cash flow projections was 17.3% (16.6% as at June 30, 2022). Cash flows beyond the five-year period have been extrapolated using a 3.0% growth rate (3.0% as at June 30, 2022). As a result of the updated analysis management did not identify an impairment for this CGU.

*O&M group of CGUs*
The Corporation used the cash-generating unit's value-in-use to determine the recoverable amount, which exceeded the carrying amount. The pre-tax discount rate applied to the cash flow projections was 16.1% (15.3% as at June 30, 2022). Cash flows beyond the five-year period have been extrapolated using a 3.0% growth rate (3.0% as at June 30, 2022). As a result of the updated analysis, there is headroom of $5.4 M and management did not identify an impairment for this CGU.

The recoverable amount of each identifiable CGU or group of CGU was established by calculating its value in use which is perform using discounted cash flow projections that are based on a one-year financial budget approved by the Board of Directors and a long-term forecast prepared by management, which covers an additional period of 4 years. The key assumptions required for the value in use estimation are the pre-tax discount rate, the revenue growth rate and the EBITDA margin. Other assumptions used include future gross profits on products and operation and maintenance. Cash flows and future gross profit were projected based on past experience and actual operating results using forecasts approved by management. The pre-tax discount rates were based on the Corporation's weighted average cost of capital using a standard capital structure and reflect specific risks related to the CGU under review.

**Sensitivity to changes in assumptions**

For the O&M group of CGUs, if the pre-tax discount rate had increased by 2.8% compared to the assumption taken by the Corporation, assuming other variable remain constant, the CGU'S recoverable amount to be equal to its carrying amount. A reduction by 1.2% of the EBITDA margin compared to the assumption taken by the Corporation, assuming other variables remain constant, would result in the CGU's recoverable amount to be equal to its carrying amount.

## 12. Accounts payable and accrued liabilities

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Trade accounts payable | **13,548** | 13,058 |
| Other accrued liabilities | **4,848** | 2,012 |
| Compensation and benefits payable | **10,351** | 8,530 |
| Sales taxes payable | **142** | - |
| | **28,889** | 23,600 |

## 13. Bank loans

On January 29, 2021, the Corporation amended the existing credit agreement and consolidated its long-term credit facilities. On September 27, 2022, the Corporation amended the existing Credit Agreement to increase its revolving facility to $65.0 M with a maturity date as at December 3, 2024 ($55.0 M as at June 30, 2022). As part of the amendment, LIBOR references were replaced, without any difference, by the Adjusted Term Secured Overnight Financing Rate ("Term SOFR"). Revolving facility advances made prior to these amendments continue to apply LIBOR rates until the end of their term. On June 30, 2023, the Corporation increased its revolving facility to $75.0 M. Therefore, following the execution of these amendments, the Corporation's operating and long-term credit facilities are now aggregating an amount of up to $85.0 M.

Under its current credit agreement, as amended from time to time, the Corporation has access to the following credit facilities:

(i) a revolving facility for a maximum amount of $75.0 M, from which an amount of $51.3 M was used as at June 30, 2023 ($45,6 M as at June 30, 2022). Transaction costs in the amount of $0.2 M have been deferred and are being amortized. The interest rates on these amounts are distributed as follow:
   - *a.* $31.5 M ($16.3 M as at June 30, 2022) bearing interest at Banker Acceptance plus 2.50% (7.31% as at June 30, 2023 and 4.34% as at June 30, 2022);
   - *b.* $nil ($2.3 M as at June 30, 2022) bearing interest at CDN prime rate plus 1.25% (4.95% as at June 30, 2022);
   - *c.* US$15.0 M ($19.9 M as at June 30, 2023 and $23.4 M as at June 30, 2022) bearing interest at US$ Libor plus 2.50% (7.51% as at June 30, 2023 and 3.62% as at June 30, 2022); and
   - *d.* US$nil ($3.7 M as at June 30, 2022) bearing interest at US$ base rate plus 1.25% (6.50% as at June 30, 2022).

(ii) a letter of credit facility for a maximum amount of $10.0 M for the issuance of letters of credit entirely secured by EDC, from which an amount of $3.1 M ($1.9 M as at June 30, 2022) was used on this credit facility as at June 30, 2023.

In addition to the above credit facilities, the Corporation has access to the following additional credit facilities:

(i) a hedging facility of $3.5 M, from which no amount was used as at June 30, 2023 ($nil as at June 30, 2022);

(ii) a credit facility enabling the Corporation to use a maximum amount of $0.8 M on credit cards for Corporation's related expenses, from which an amount of $0.2 M was used as at June 30, 2023 ($0.2 M as at June 30, 2022); and

(iii) a reverse factoring facility of US$7.5 M, from which no amount was used as at June 30, 2023 ($nil as at June 30, 2022).

In order to secure these credit facilities, the Corporation (and its affiliated entities) granted first ranking (i) movable hypothec on the universality of all its present and future assets in an amount of $135.0 M for each grantor, and (ii) immovable hypothec on all the real property owned by the Corporation.

### Covenants

This current credit agreement requires that the Corporation meet the following financial ratios:

- Total Debt-to-EBITDA ratio, defined as total debt divided by EBITDA not exceeding a certain limit at all time.
- Fixed charge coverage ratio, including all capital and interest payments on borrowings due and capital expenditures not exceeding a certain limit at all time.

Management reviews compliance with these covenants on a quarterly basis in conjunction with filing requirements under its credit facilities. As at June 30, 2023 and 2022 for the year then ended, all covenants have been met.

## 14. Long-term debt

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| ***At amortized cost*** | | |
| Loans denominated in US dollars (a) | **481** | 1,960 |
| Loans denominated in Canadian dollars (b) | **61** | 113 |
| | **542** | 2,073 |
| Less: Current portion | **243** | 1,563 |
| Long-term debt | **299** | 510 |

(a) Loans denominated in US dollars
The Corporation contracted financing agreements totaling $1,281 (US$967) to finance the acquisition of automotive equipment and machinery and equipment. The loans bear interest ranging between 0.99% and 10.35% and are payable between 48 and 72 monthly instalments totaling $24 (US$18), principal and interest, and are maturing through August 2023 to October 2026.

As part of the acquisition of Leader, the Corporation has assumed a non-bearing interest loan totaling $1,159 (US$900) from the Town of Swanton. On July 1, 2022, after repayment of $130 (US$100) the Corporation was released from its outstanding loan of the remaining amount of $1,029 (US$800) which was recorded as a gain on debt extinguishment in other gains of the consolidated statements of earnings (loss).

(b) Loans denominated in Canadian dollars
The Corporation contracted financing agreements totaling $274. The loans bear interest ranging between 4.79% and 8.63% and are payable between 60 and 99 monthly instalments totaling $5, principal and interest, and are maturing through August 2023 to June 2027.

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

The following table presents reconciliation between the opening and closing balances for the long-term debt:

| **As at June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Long-term debt, at beginning of the year | **2,073** | 15,916 |
| Increase in long-term debt | **150** | 64 |
| Debt acquired through business acquisition | **-** | 1,826 |
| Repayment of long-term debt | **(660)** | (15,953) |
| Gain on debt extinguishment | **(1,029)** | - |
| Amortization of financing costs and write-offs | **-** | 200 |
| Effect of foreign exchange differences | **8** | 20 |
| **Long-term debt, at end of the year** | **542** | 2,073 |

The annual principal instalments due on the long-term debt are $243 in 2024, $186 in 2025, $89 in 2026, $24 in 2027 and $nil thereafter. The Corporation has $0.2 M non-cash increase in long-term debt ($nil as at June 30, 2022).

## 15. Contingent considerations

The change in carrying value of the contingent considerations is as follows:

| | **$** |
|---|---|
| Balance as at June 30, 2021 | 6,738 |
| Plus: Contingent consideration – JCO and EC (note 5 b) | 1,745 |
| Plus: Change in fair value of contingent considerations | 2,565 |
| Less: Payment of contingent considerations | (1,093) |
| Effect of foreign exchange differences | 62 |
| Balance as at June 30, 2022 | 10,017 |
| **Plus: Change in fair value of contingent considerations** | **1,090** |
| **Less: Payment of contingent considerations** | **(6,051)** |
| **Effect of foreign exchange differences** | **88** |
| **Balance as at June 30, 2023** | **5,144** |
| | |
| **Less: Current portion** | **5,144** |
| **Contingent consideration – non-current portion** | **-** |

The contingent consideration was settled and paid on August 11, 2023 for a final amount of $5,144.

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

## 16. Income taxes

Income taxes expense (recovery) is detailed as follows:

| **As at June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Current tax expense: | | |
| Current period | **1,119** | 1,156 |
| Adjustment for prior periods | **48** | (204) |
| | **1,167** | 952 |
| | | |
| Deferred tax expense (recovery): | | |
| Origination and reversal of temporary differences | **(493)** | 707 |
| Recognition of tax benefits previously unrecorded | **-** | (5,170) |
| Utilization of tax benefits previously unrecorded | **-** | (591) |
| Changes in tax rate | **18** | 840 |
| Adjustment for prior periods | **58** | (356) |
| | **(417)** | (4,570) |
| **Income taxes** | **750** | (3,618) |

Income tax expense (recovery) recognized in equity:

| **As at June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Deferred tax related to items recognized in other comprehensive income during the year | | |
| Origination and reversal of temporary differences | **86** | 28 |
| **Deferred tax charged to OCI** | **86** | 28 |

| **As at June 30,** | **2023** | 2022 |
|---|---|---|
| Deferred tax related to items recognized in share capital and retained earnings: | | |
| Origination and reversal of temporary differences | **292** | (1,689) |
| **Deferred tax charge to share capital** | **292** | (1,689) |

## NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
## (in thousands of Canadian dollars, except per share data)

**Reconciliation of the Corporation's effective income tax expense**

The Canadian statutory tax rate is 26.19% (26.05% for 2022). The following is a reconciliation of income taxes calculated at the Canadian statutory tax rate to the expense for 2023 and 2022.

| **As at June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Net earnings (loss) before income taxes | **(546)** | 1,489 |
| Income taxes at the Canadian statutory tax rate of 26.19% (26.05% in 2022) | **(143)** | 388 |
| **Tax effect from:** | | |
| Effect of differences in tax rates in other jurisdictions | **402** | 163 |
| Changes in statutory rates | **18** | 840 |
| Non-deductible stock-based payments | **571** | 340 |
| Recognition of tax benefits previously unrecorded | **-** | (5,170) |
| Utilization of tax benefits previously unrecorded | **-** | (591) |
| Adjustments in respect of prior years | **106** | (560) |
| Non-deductible items | **124** | 512 |
| Other | **(328)** | 460 |
| **Total income tax expense** | **750** | (3,618) |

**Deferred tax (liabilities) assets**

| **As at June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Reconciliation to the consolidated statements of financial position: | | |
| Deferred tax assets | **6,330** | 6,889 |
| Deferred tax liabilities | **(3,921)** | (4,519) |
| **Net deferred tax (liabilities) assets** | **2,409** | 2,370 |

Net deferred tax assets of $590 were recognized as at June 30, 2023 (net deferred tax assets of $6,859 as at June 30, 2022) in jurisdictions that incurred losses this fiscal year or the preceding fiscal year. Based upon the level of historical taxable income, projections for future taxable income and prudent tax planning strategies, management believes it is probable the Corporation will realize the benefits of these deductible differences and operating losses carried forward. See note 3, Critical accounting estimates, assumptions and judgments for more information on how the Corporation determines the extent to which deferred tax assets are recognized.

## NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
## (in thousands of Canadian dollars, except per share data)

Changes to deferred tax assets (liabilities) related to temporary differences as follows:

| | Balance as at July 1, 2022 | Recognized in earnings | Recognized in equity | Recognized in other comprehensive loss | Balance as at June 30, 2023 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| Non-capital losses | 4,969 | (1,313) | (122) | 53 | 3,587 |
| Property, plant and equipment | (4,004) | (1,845) | - | (175) | (6,024) |
| Intangible assets | (4,936) | 1,682 | - | (25) | (3,279) |
| Goodwill | (249) | (733) | - | 1 | (981) |
| Lease obligations | 3,359 | 507 | - | 34 | 3,900 |
| U.S. interests not deducted and deferred | 912 | 1,456 | - | 8 | 2,376 |
| Financing and share issue expenses | 450 | (27) | (170) | - | 253 |
| Research and development expenses | 604 | (84) | - | - | 520 |
| Other assets | 1,265 | 774 | - | 18 | 2,057 |
| | 2,370 | 417 | (292) | (86) | 2,409 |

| | Balance as at July 1, 2021 | Recognized in earnings | Recognized in equity | Recognized in other comprehensive loss | Balance as at June 30, 2022 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| Non-capital losses | 68 | 3,527 | 1,374 | - | 4,969 |
| Property, plant and equipment | (967) | (2,970) | (67) | - | (4,004) |
| Intangible assets | (4,781) | (194) | 39 | - | (4,936) |
| Goodwill | (395) | 238 | (92) | - | (249) |
| Lease obligations | 480 | 2,844 | 35 | - | 3,359 |
| U.S. interests not deducted and deferred | 643 | 239 | 30 | - | 912 |
| Financing and share issue expenses | - | 115 | 335 | - | 450 |
| Research and development expenses | - | 604 | - | - | 604 |
| Other assets | 1,091 | 167 | 35 | (28) | 1,265 |
| | (3,861) | 4,570 | 1,689 | (28) | 2,370 |

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
**(in thousands of Canadian dollars, except per share data)**

## 17. Lease liabilities

*Corporation as a Lessee*

The following table presents the lease liabilities for the Corporation as of June 30, 2023:

| | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Lease liabilities, beginning of year | **16,925** | 10,954 |
| Additions | **1,413** | 4,805 |
| Disposals and write-off | **(117)** | - |
| Business combination | **-** | 3,021 |
| Payment of lease liabilities | **(2,834)** | (2,171) |
| Interest expense on lease liabilities | **875** | 457 |
| Effect of changes in exchange rates | **602** | (141) |
| **Lease liabilities as at June 30, 2023** | **16,864** | 16,925 |
| **Current portion** | **1,717** | 1,898 |
| **Non-current portion** | **15,147** | 15,027 |

The Corporation has lease contracts for buildings, machinery and equipment, and automotive equipment used in its operations. The expense related to short-term leases and low-value assets leases during the year ended June 30, 2023 was $148 ($121 as at June 30, 2022). The expense related to variable lease payments not included in the measurement of lease liabilities during the year ended June 30, 2023 was $564 ($429 as at June 30, 2022). The Corporation also had non-cash additions to lease liabilities of $1.4 M in 2023 ($4.8 M in 2022).

The following table presents the maturity analysis of contractual undiscounted cashflows related to the lease liabilities of the Corporation as of June 30, 2023:

| | $ |
|---|---|
| Less than one year | 2,556 |
| 1 to 5 years | 10,932 |
| More than 5 years | 9,090 |
| **Total undiscounted lease liabilities as at June 30, 2023** | **22,578** |

The Corporation had lease contracts that had not yet commenced as at June 30, 2023. The future lease payments for these non-cancellable lease contracts are $336 within one year, $2,891 within five years and $5,093 thereafter.

*Corporation as a Lessor*

The Corporation has entered into operating leases on its mobile water treatment systems portfolio. Future minimum rentals receivable under non-cancellable operating leases as at June 30, 2023 are, as follows:

| | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Within one year | 2,528 | - |
| Between 1 and 2 years | 1,883 | - |
| Between 2 and 3 years | 232 | - |
| | **4,643** | **-** |

**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**
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## 18. Capital stock

### Share capital

The Corporation has authorized an unlimited number of common shares (being voting and participating shares) with no par value.

As at June 30, 2023, and 2022 the Corporation has a total of 90,007,408 shares issued and outstanding.

### Stock options

The Corporation has established a stock option plan whereby the Board of Directors may grant stock options to directors, executive officers, key employees and consultants providing services to the Corporation. The Board of Directors determines, at its discretion, the vesting terms, if applicable, the expiry date of options and the number of options to be granted. The maximum number of shares that may be issued under the plan amounts to 8,000,000. Stock options generally vest over 3 to 8 years from the date of grant conditionally upon achievement of performance objectives and must be exercised within a ten-year period, except in the event of retirement, termination of employment or death.

The following table summarizes the situation of the Corporation's stock-based compensation plan as at June 30, 2023 and June 30, 2022 and the change during the years ended on these dates:

| **Years ended June 30,** | **2023** | | 2022 | |
|---|---|---|---|---|
| | **Number** | **Weighted average exercise price** | Number | Weighted average exercise price |
| | | **$** | | $ |
| Outstanding – Beginning of year | **6,008,334** | **2.11** | 3,359,334 | 1.93 |
| Granted | **-** | **-** | 2,673,000 | 2.33 |
| Expired | **-** | **-** | - | - |
| Forfeited | **(106,500)** | **2.37** | (24,000) | 2.64 |
| Outstanding – End of year | **5,901,834** | **2.10** | 6,008,334 | 2.11 |
| Exercisable – End of year | **2,997,401** | **1.97** | 1,650,784 | 1.77 |

As at June 30, 2023, the following stock options were outstanding:

| | | Options outstanding | Options exercisable |
|---|---|---|---|
| Exercise price | Number of shares | Weighted average remaining life (years) | Number of shares |
| $ | | | |
| 1.65 | 2,303,334 | 1.07 | 1,727,501 |
| 2.55 | 1,056,000 | 7.88 | 422,400 |
| 2.64 | 517,500 | 8.38 | 172,500 |
| 2.25 | 2,025,000 | 8.88 | 675,000 |
| | 5,901,834 | 5.61 | 2,997,401 |

The weighted average fair value of stock options granted in the year and the weighted average assumptions used in the calculation of their fair value on the date of grant using the Black-Scholes option pricing model were as follows:

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| Expected dividend yield (%) | - | - |
| Expected volatility (%) | - | 56.26 |
| Risk-free interest rate (%) | - | 2.45 |
| Expected life (years) | - | 5.79 |
| Fair value at the grant date ($) | - | 1.20 |
| Exercise price ($) | - | 2.33 |
| Share price ($) | - | 2.28 |

The expected volatility was determined using statistical formulas and based on the closing daily share prices over the period of the expected life of stock options.

For the year ended June 30, 2023, the amount recorded as stock-based compensation for options granted to its directors, officers and key employees is $2,180 ($1,303 in 2022).

## 19. Contract assets and contract liabilities

Contract assets and contract liabilities are as follow:

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Construction costs related to projects incurred plus recognized profits less recognized losses to date | **108,598** | 78,370 |
| Less: progress billings | **(105,321)** | (72,986) |
| Consolidated statements of financial position for ongoing projects contracts | **3,277** | 5,384 |

Recognized and included in the consolidated statements of financial position as amounts due:

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| From customers under project contracts (contract assets) | **11,087** | 11,591 |
| To customers under project contracts (contract liabilities) | **(7,810)** | (6,207) |
| Consolidated statements of financial position for ongoing projects contracts | **3,277** | 5,384 |

During the year, $5,060 of revenues were recorded for amounts included in contract liability at the beginning of the year ($3,219 in fiscal year 2022).

*Remaining performance obligations*

The amount of transaction price allocated to performance obligations that are unsatisfied (or partially satisfied) at June 30, 2023, on all contracts with customers, is expected to be recognized in revenues as follows:

| | 2024 | 2025 | 2026 | Thereafter | Total |
|---|---|---|---|---|---|
| WTS | $33.8M | $19.4M | $5.6M | - | $58.8M |
| O&M | $47.3M | $41.3M | $28.7M | $13.5M | $130.8M |

The amount of transaction price allocated to performance obligations that are unsatisfied (or partially satisfied) at June 30, 2022, on all contracts with customers, was expected to be recognized in revenues as follows:

| | 2023 | 2024 | 2025 | Thereafter | Total |
|---|---|---|---|---|---|
| WTS | $29.7M | $5.6M | $1.3M | - | $36.6M |
| O&M | $41.3M | $34.1M | $29.4M | $21.6M | $126.4M |

It should be noted that these amounts exclude any estimated amounts of variable consideration that are excluded from the transaction price. WTS amounts include operating leases for its mobile water treatment systems portfolio.

## 20. Additional information about the nature of costs components

### a) Expenses by nature

| **Years ended June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Material | **100,263** | 68,364 |
| Salaries and fringe benefits | **96,189** | 71,586 |
| Subcontractors and professional fees | **13,209** | 11,746 |
| Rent, electricity, insurance and office expenses | **6,121** | 5,090 |
| Telecommunications and travel expenses | **6,061** | 3,723 |
| Bad debt expenses | **41** | 20 |
| Repair and maintenance | **2,634** | 960 |
| Marketing and promotion | **1,187** | 430 |
| Share based compensation | **2,180** | 1,303 |
| Other expenses | **5,890** | 4,903 |
| Total cost of goods sold, selling, general and administrative expenses | **233,775** | 168,125 |
| Depreciation of property, plant and equipment and right-of-use assets (notes 8 and 10) | **5,814** | 3,812 |
| Amortization of intangible assets (note 9) | **6,428** | 5,419 |
| **Costs including depreciation and amortization** | **246,017** | 177,356 |

### b) Depreciation and amortization

The Corporation has elected to present depreciation and amortization as a separate line item in its consolidated statements of earnings (loss), as opposed to reflecting the fraction of such amount that pertains to each of the cost of goods sold, selling, general and administrative expenses, within those cost categories. The following tables provide: i) a breakdown of the depreciation and amortization expense by cost category as noted above, for the years ended June 30, 2023 and 2022; and ii) the amounts of cost of goods sold, selling, general and administrative expenses, if depreciation and amortization were allocated within those cost categories for the periods as noted above.

**Depreciation of property, plant and equipment and right-of-use assets by function**

| **Years ended June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Cost of goods sold | **4,482** | 2,752 |
| Selling, general and administrative expenses | **1,332** | 1,060 |
| | **5,814** | 3,812 |

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**Amortization of intangible assets by function**

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Cost of goods sold | 167 | 221 |
| Selling, general and administrative expenses | 6,261 | 5,198 |
| | 6,428 | 5,419 |

**Cost per function including depreciation and amortization**

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Cost of goods sold | 194,213 | 137,722 |
| Selling, general and administrative expenses | 51,804 | 39,634 |
| | 246,017 | 177,356 |

### c) Other (gains) and losses – net

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Unrealized exchange (gain) loss | 532 | (181) |
| Realized exchange (gain) loss | 176 | 257 |
| Gain on debt extinguishment | (1,029) | - |
| Other (gains) losses | 144 | (124) |
| Changes in fair value of contingent consideration (note 15) | 1,090 | 2,565 |
| | 913 | 2,517 |

## 21. Net earnings (loss) per share

The following table sets out the weighted average basic and diluted number of outstanding shares used to compute the basic and diluted net earnings (loss) per share:

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| Net earnings (loss) | ($1,296) | $5,107 |
| Basic weighted average number of share outstanding | 90,007,408 | 88,189,057 |
| Effects of dilution from: | | |
| Warrants if not anti-dilutive | - | 1,308,490 |
| Stock options if not anti-dilutive | - | 4,403,334 |
| **Weighted average number of share outstanding adjusted for the effect of dilution** | 90,007,408 | 93,900,881 |
| Basic net earnings (loss) per share | ($0.014) | $0.058 |
| Diluted net earnings (loss) per share | ($0.014) | $0.054 |

The following items are excluded from the calculation of basic and diluted net earnings or loss per share because their exercise price was greater than the average market price of the common shares or due to their anti-dilutive effect:

| | **2023** | 2022 |
|---|---|---|
| Stock options | **5,901,834** | 1,605,000 |
| Warrants | **-** | - |

For the year ended June 30, 2023, a net loss was recorded and therefore the basic and diluted weighted average number of shares used in the calculation is the same.

## 22. Financial risk management

The Corporation's activities expose it to a variety of financial risks: market risks (including currency risk, cash flow interest rate risk and fair value interest rate risk), credit risk and liquidity risk. The Corporation's overall financial risk management program focuses on mitigating unpredictable financial market risks and their potential adverse effects on the Corporation's financial performance.

The Corporation's financial risk management is generally carried out by the corporate team, based on policies approved by the Board of Directors. The identification and evaluation of the financial risks are the responsibility of the corporate team.

### Overview

The Corporation's financial instruments and the nature of risks which they may be subject to are set out in the following table:

| | **Risks** | | | |
|---|---|---|---|---|
| | **Market risks** | | | |
| **Financial instrument** | **Currency** | **Interest rate** | **Credit** | **Liquidity** |
| Cash | X | X | X | |
| Accounts receivable | X | | X | |
| Related party loans receivable | | X | X | |
| Other assets | | | X | |
| Bank loans | X | X | | X |
| Accounts payable and other accrued liabilities | X | | | X |
| Long-term debt | X | X | | X |
| Other non-current financial liabilities | | X | | X |
| Contingent considerations | X | X | | X |

### Currency risk

The Corporation is exposed to exchange risk as a result of its foreign exchange purchases and sales, denominated in U.S. dollar, EURO and British pound and also as a result of its foreign subsidiary net assets. The Corporation's objective in managing the currency risk is to minimize the exposure to currencies other than the functional currency. The Corporation does not use derivative financial instruments to cover the variability of cash flows in foreign currencies.

As at June 30, 2023, if the Canadian dollar had increased or decreased by five percent (5%) compared to the U.S. dollar, EURO or British pound currency, assuming that all other variables remained constant, net earnings (loss) for the year ended June 30, 2023 would have been greater or lesser by approximately $1,198 ($1,535 for the year ended June 30, 2022) and the comprehensive earnings or loss would have been greater or lesser by approximately $1,315 ($1,218 for the year ended June 30, 2022).

## NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
## (in thousands of Canadian dollars, except per share data)

The financial assets and liabilities denominated in a foreign currency (U.S. dollar and EURO) included in the Canadian entities are as follows:

| As at June 30, | | | 2023 | | | 2022 |
|---|---|---|---|---|---|---|
| | **U.S. dollar** | **EURO** | **Total** | U.S. dollar | EURO | Total |
| | **$** | **$** | **$** | $ | $ | $ |
| Financial assets | | | | | | |
| Cash | **914** | **138** | **1,052** | 128 | 358 | 486 |
| Accounts receivable | **1,567** | **1,107** | **2,674** | 2,314 | 999 | 3,313 |
| Prepaid expenses and deposits | **150** | **82** | **232** | 1,688 | 794 | 2,482 |
| | **2,631** | **1,327** | **3,958** | 4,130 | 2,151 | 6,281 |
| Financial liabilities | | | | | | |
| Bank loans | **(19,871)** | **-** | **(19,871)** | (27,108) | - | (27,108) |
| Long-term debt | **(487)** | **-** | **(487)** | (1,960) | - | (1,960) |
| Accounts payable and accrued liabilities | **(1,601)** | **(187)** | **(1,788)** | (984) | (176) | (1,160) |
| | **(21,959)** | **(187)** | **(22,146)** | (30,052) | (176) | (30,228) |

### Cash flow and fair value interest rate risk

In the normal course of business, the Corporation is exposed to interest rate fluctuation risk as a result of the cash, related party loans receivable, bank loans, contingent consideration and long-term debt. The Corporation does not use derivatives to cover this risk.

The related party loans receivable and the long-term debt bear interest at fixed rates and are accounted for at amortized cost. The Corporation is, therefore, not exposed to the risk of cash flows, however is exposed to changes in fair value resulting from interest rate fluctuations.

The bank loans and the long-term debt bear interest at floating rates and the Corporation is, therefore, exposed to the cash flow risks resulting from interest rate fluctuations.

As at June 30, 2023 and 2022, a 100-basis-point increase or decrease in interest rates, assuming that all other variables remain constant, would not have had a significant impact on the Corporation's net earnings or loss and comprehensive earnings or loss. These changes were retained because they are considered reasonably possible according to observations and the economic situation.

### Credit risk

Credit risk relates to the risk that a party to a financial instrument will not fulfil some or all of its obligations, thereby causing the Corporation to sustain a financial loss. The main risk relates to cash, accounts receivable and contract assets. To manage its credit risk, the Corporation reviews credit limits, monitors aging of accounts receivable and contract assets and establishes an allowance for expected credit losses based on historical credit loss experience, adjusted for forward-looking factors specific to the customer and the economic environment. The Corporation mitigate its credit risk by providing services to a large number of customers, spread across diverse industries and geographical areas. Ongoing credit evaluation is performed on the financial condition of accounts receivable and contract assets. Furthermore, the Corporation insures a portion of its accounts receivable through insurance coverage. As at June 30, 2023, the allowance for expected credit losses was $301 ($196 as at June 30, 2022) and nil$ for contract assets.

The Corporation's maximum amount of credit risk exposure is limited to the carrying amount of these financial instruments and contract assets summarizes in the following table:

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Cash | **17,071** | 7,382 |
| Accounts receivable | **36,629** | 35,696 |
| Contract assets | **11,087** | 11,591 |
| Other assets | **170** | 157 |
| Related party loans receivable | **1,250** | 1,250 |

The Corporation holds cash with investment grade financial institutions and loans with related party, which are secured by a pledge of the acquired common shares (see note 26 a). Therefore, the Corporation considers the risk of non-performance on these instruments to be minimal.

The table below summarizes the aging of trade accounts receivable:

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Current | **17,650** | 18,349 |
| Past due 1 to 30 days | **7,026** | 5,120 |
| Past due 31 to 90 days | **4,491** | 6,062 |
| Past due more than 90 days | **3,277** | 2,371 |
| | **32,444** | 31,902 |
| Less: Allowance for expected credit losses | **(301)** | (196) |
| Trade accounts receivable | **32,143** | 31,706 |
| Hold back from customers under project contracts | **4,028** | 3,806 |
| Other receivables | **458** | 184 |
| | **36,629** | 35,696 |

### Liquidity risk

Liquidity risk is the risk that the Corporation will be unable to fulfil its obligations on a timely basis or at reasonable cost. The Corporation manages its liquidity risk by monitoring its operating requirements and using various funding sources to ensure its financial flexibility. The Corporation prepares budgets and cash forecasts to ensure that it has sufficient funds to fulfil its obligations. Refer to note 24 for detail of the commitments.

For its investing activities, the Corporation will evaluate its liquidity needs when applicable and take the necessary action.

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The following table presents the financial liability and lease liability instalments payable when contractually due including accrued interest:

| **As at June 30, 2023** | Contractual undiscounted payments | 0 - 1 year | 1 - 2 years | 2 - 3 years | 4 years and more |
|---|---|---|---|---|---|
| | **$** | **$** | **$** | **$** | **$** |
| Bank loans | **51,274** | **-** | **51,274** | - | - |
| Accounts payable and accrued liabilities | **28,889** | **28,889** | - | - | - |
| Long-term debt | **598** | **274** | **200** | **93** | **31** |
| Lease liabilities | **22,578** | **2,556** | **2,518** | **2,434** | **15,070** |
| Other non-current financial liabilities | **-** | - | - | **-** | - |
| Contingent considerations | **5,144** | **5,144** | **-** | - | - |
| **Total** | **108,483** | **36,863** | **53,992** | **2,527** | **15,101** |

| As at June 30, 2022 | Contractual undiscounted payments | 0 - 1 year | 1 - 2 years | 2 - 3 years | 4 years and more |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| Bank loans | 45,562 | - | - | 45,562 | - |
| Accounts payable and accrued liabilities | 23,600 | 23,600 | - | - | - |
| Long-term debt | 2,159 | 1,609 | 260 | 190 | 100 |
| Lease liabilities | 22,728 | 2,651 | 2,257 | 2,168 | 15,652 |
| Other non-current financial liabilities | 173 | - | - | 173 | - |
| Contingent considerations | 10,017 | 10,017 | - | - | - |
| **Total** | **104,239** | **37,877** | **2,517** | **48,093** | **15,752** |

### Fair value

The fair value of financial instruments is based on quoted market prices when an active market exists. Otherwise, it is estimated using techniques and valuation models, such as analysis of discounted cash flows for the long-term debt, for which the significant unobservable inputs used are the discount rates which reflects the Corporation's credit risk.

There was no transfer between the levels of fair value hierarchy during the year.

*Financial instruments whose fair value approximates carrying value*
Cash, accounts receivable, related party loans receivable, other assets, bank loans, accounts payable and accrued liabilities are financial instruments whose fair value approximates their carrying value due to their short-term maturity.

*Long-term debt*
The fair value of the long-term debt has been established by discounting the future cash flows at an interest rate to which the Corporation would currently be able to obtain for loans with similar maturity dates and terms. The fair value of the long-term debt is $598 ($2,159 as at June 30, 2022) and was determined to be a level 2 financial instrument.

*Contingent considerations*
As at June 30, 2023, the fair value of the contingent consideration corresponds to the amount paid on August 11, 2023. As at June 30, 2022 the fair value of the contingent considerations amounting to $10,017 has been established by discounting the future cash flows using unobservable (level 3) inputs. These inputs include (i) the estimated amount and timing of projected cash flows; and (ii) the risk-adjusted discount rate used to present value the cash flows which is based on the risk associated with the revenue targets being met.

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## 23. Capital management

The Corporation's objective in managing capital is to ensure sufficient liquidity to pursue its growth while at the same time taking a prudent approach towards financial leverage and financial risk.

The Corporation's capital is composed of net debt and shareholders' equity. Net debt consists of bank loans and long-term debt less cash. The Corporation's primary uses of capital are to finance increases in non-cash working capital and capital expenditures for capacity expansion and integration.

| **As at June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| Bank loans | **51,274** | 45,562 |
| Long-term debt | **542** | 2,073 |
| Less: Cash | **(17,071)** | (7,382) |
| **Net debt** | **34,745** | 40,253 |
| Shareholders' equity | **99,725** | 96,428 |
| **Shareholders' equity and net debt** | **134,470** | 136,681 |

The Corporation monitors its performance through different ratios such as those required under its credit facility and long-term debt arrangements (note 14).

As at June 30, 2023 and 2022 and for the years then ended, the Corporation was in compliance with the ratios required under its credit facility and long-term debt arrangements.

## 24. Commitments and contingencies

### Commitments

As at June 30, 2023, the Corporation had commitments relating to purchase agreements with specific suppliers. The minimum payments over the next five years are as follows:

| | **2024** | **2025** | **2026** | **2027** | **2028** | **Thereafter** | **Total** |
|---|---|---|---|---|---|---|---|
| Purchase agreements commitments | $2,313 | $472 | $388 | $97 | $- | $- | $3,270 |

### Legal claim contingency

Various claims and legal proceedings have been initiated against the Corporation in the normal course of its operating activities. Although the outcome of these proceedings cannot be determined with certainty, management estimates that any payments resulting from their outcome are not likely to have a substantial negative impact on the Corporation's consolidated financial statements. The Corporation limits its exposure to some risks of claims related to its activities by subscribing to insurance policies.

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## 25. Segment information

### Products from which reportable segments derive their revenues

For management purposes, the Corporation is organized into business pillars based on its different products and services. The Corporation operates under three distinct reportable segment consisting of: i) water technologies and services, including mobile water treatment systems ("WTS"); ii) specialty products, including a complete line of maple equipment and products, specialty chemicals, consumables, and specialized products for the water treatment industry (couplings and cartridge filters) ("Specialty Products"); and iii) operation and maintenance services for water and wastewater treatment systems ("O&M").

The Corporation's chief operating decision maker evaluates segment performance on the basis of earnings before administrative expenses and others items as reported to internal management, on a periodic basis.

The following is a measure of profit or loss for each reportable segment as used by the chief operating decision maker:

| | For the year ended June 30, 2023 | | | |
|---|---|---|---|---|
| | **WTS** | **Specialty Products** | **O&M** | **Total** |
| | **$** | **$** | **$** | **$** |
| Revenue from external customers: | | | | |
| Revenue recognized over time | **29,041** | **-** | **117,654** | **146,695** |
| Revenue recognized at a point in time | **20,056** | **85,527** | **-** | **105,583** |
| Rental income | **1,041** | **-** | **-** | **1,041** |
| | **50,138** | **85,527** | **117,654** | **253,319** |
| Cost of goods sold | **38,691** | **51,484** | **99,389** | **189,564** |
| Gross profit before depreciation and amortization | **11,447** | **34,043** | **18,265** | **63,755** |
| Selling and general expenses | **6,880** | **15,756** | **5,208** | **27,844** |
| Earnings before administrative costs and other items listed below (EBAC) | **4,567** | **18,287** | **13,057** | **35,911** |
| Administrative costs | | | | **16,367** |
| Depreciation of property, plant and equipment and right-of-use assets | | | | **5,814** |
| Amortization of intangible assets | | | | **6,428** |
| Other (gains) and losses – net | | | | **913** |
| Acquisition and integration costs | | | | **1,186** |
| Finance costs – net | | | | **5,749** |
| Loss before income taxes | | | | **(546)** |

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| | For the year ended June 30, 2022 | | | |
|---|---|---|---|---|
| | WTS | Specialty Products | O&M | Total |
| | $ | $ | $ | $ |
| Revenue from external customers: | | | | |
| Revenue recognized over time | 27,845 | - | 87,519 | 115,364 |
| Revenue recognized at a point in time | 14,595 | 54,397 | - | 68,992 |
| | 42,440 | 54,397 | 87,519 | 184,356 |
| Cost of goods sold | 33,468 | 28,779 | 72,502 | 134,749 |
| Gross profit before depreciation and amortization | 8,972 | 25,618 | 15,017 | 49,607 |
| Selling and general expenses | 5,072 | 10,425 | 4,484 | 19,981 |
| Earnings before administrative costs and other items listed below (EBAC) | 3,900 | 15,193 | 10,533 | 29,626 |
| Administrative costs | | | | 13,395 |
| Depreciation of property, plant and equipment and right-of-use assets | | | | 3,812 |
| Amortization of intangible assets | | | | 5,419 |
| Other (gains) and losses – net | | | | 2,517 |
| Government tax credit | | | | (500) |
| Acquisition and integration costs | | | | 1,135 |
| Finance costs – net | | | | 2,359 |
| Earnings before income taxes | | | | 1,489 |

### Geographical information

| **Years ended June 30,** | **2023** | 2022 |
|---|---|---|
| | **$** | $ |
| **Revenues from external customers** | | |
| Revenue according to geographic area | | |
| Americas: | | |
| Canada | **22,186** | 21,533 |
| United States | **178,876** | 127,616 |
| Chile | **7,727** | 3,087 |
| Latin America | **4,281** | 3,815 |
| Europe: | | |
| United Kingdom | **1,363** | 1,288 |
| Spain | **4,268** | 6,525 |
| Others | **3,472** | 3,298 |
| Middle East and Africa: | | |
| Saudi Arabia | **4,188** | 2,497 |
| United Arab Emirates | **2,719** | 1,810 |
| Other Middle East countries | **2,566** | 2,255 |
| Africa | **8,072** | 3,278 |
| Asia Pacific: | | |
| China | **8,587** | 3,106 |
| Republic of Korea | **2,074** | 99 |
| Others | **2,940** | 4,149 |
| | **253,319** | 184,356 |

Revenues are attributed to the various countries according to the customer's country of residence.

| As at June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Non-current assets excluding other assets, related party loans receivable and deferred income tax asset according to geographic location | | |
| Canada | **10,419** | 7,631 |
| United States | **71,254** | 71,191 |
| United Kingdom | **25,769** | 26,533 |
| Spain | **11,254** | 11,861 |
| Chile | **131** | 93 |
| | **118,827** | 117,309 |

### Information about major customers

For the fiscal years ended June 30, 2023 and June 30, 2022, no customer accounted for more than ten percent (10%) of its revenues.

## 26. Related party disclosure and remuneration

### a) Related party loans receivable

Following the approval of the disinterested shareholders of the Corporation at the annual meeting of its shareholders held on November 15, 2016, the Corporation extended to executive officers, individual loans in an aggregate amount of $1,250 (the "Loans"), effective as of July 26, 2016, in order for them to acquire common shares as part of a non-brokered private placement. These loans are repayable in one single installment on the 8th anniversary of the effective date and can be reimbursed in full at any time before the end of the term, without penalty. These loans bear interest at a rate of 2.01%, payable monthly. They are secured by a pledge of the acquired common shares. The market value of the underlying common shares pledged to secure these loans was $3,240 as at June 30, 2023 ($1,250 as at June 30, 2022).

An amount of $25 was paid to the Corporation in regards of these loans and recorded as finance income in the consolidated statements of earnings (loss) for the year ended June 30, 2023 ($25 for the year ended June 30, 2022).

### b) Compensation of executive officers and board of directors

The remuneration of executive officers and of the Board of Directors during the period was as follows:

| Years ended June 30, | 2023 | 2022 |
|---|---|---|
| | $ | $ |
| Short-term benefits (1) | **2,164** | 2,124 |
| Post-employment benefits (2) | **206** | 225 |
| Share-based payments | **473** | 825 |
| Long-term incentive plan | **260** | 87 |
| | **3,103** | 3,261 |

(1) Short-term benefits include mainly wages, salaries, bonuses and other non-monetary benefits.
(2) Post-employment benefits include the Corporation's share purchase plan contribution.

The amounts disclosed in the table are the amount recognized as an expense during the reporting period related to the executive officers and members of the Board of Directors.

The remuneration of executive officers and Board of Directors is determined by the Corporation's corporate governance, remuneration and ESG committee having regards to the performance of individuals and market trends and approved by the Board of Directors.

## GENERAL INFORMATION

### Board of Directors

**Pierre Côté**, Director [3]
**Frédéric Dugré**, President, Chief Executive Officer and Director
**Leonard Graziano**, Director [3]
**Stéphane Guérin,** Director [1]
**Lisa Henthorne**, Chairwoman of the Board of Directors [2]
**Richard Hoel**, Director and Vice Chairman of the Board of Directors [1][3]
**Bertrand Lauzon**, Director [1][2]
**Caroline Lemoine,** Director [2][3]
**Elisa Speranza,** Director [2]

### Management

**Frédéric Dugré**, President, Chief Executive Officer and co-Founder [3]
**Marc Blanchet**, Chief Financial Officer
**Guillaume Clairet**, Chief Operating Officer [3]
**Gregory Madden**, Chief Strategy Officer
**Edith Allain,** Vice President, Corporate & Legal Affairs and Corporate Secretary
**Jean-Philippe Pilote,** Vice President, Finance
**Jean-Paul Bêty,** Vice President, IT and Business Software Solution
**Denis Guibert**, Vice President & Managing Director of WTS [4]
**Rock Gaulin**, Vice President & Managing Director of Maple
**William Douglass**, Vice President & Managing Director of O&M [5]
**Ties Venema**, Vice President & Managing Director of S3C [6]

[1] Audit Committee
[2] Governance, Remuneration and ESG Committee
[3] Strategy, Innovation and Large Projects Committee
[4] Water Technologies and Services
[5] Operation and Maintenance
[6] Specialty Chemicals, Components and Consumables

### Legal Counsel

McCarthy Tétrault S.E.N.C.R.L.

### Independent Auditors

Ernst & Young LLP

### Transfer Agent

TSX Trust Company

## OFFICES AND PLANTS

### Head Office

330, rue St-Vallier Est, Suite 340
Quebec City, Quebec, G1K 9C5
Phone: 418.688.0170
Fax: 418.688.9259

investor@h2oinnovation.com
www.h2oinnovation.com

### Manufacturing Plants

201 1st Avenue, Ham-Nord, Quebec, G0P 1A0

1048 La Mirada Court, Vista, CA 92081

8900, 109th Ave N, Suite 1000. Champlin, MN 553160

3a and 5 Aston Way
Middlewich, Cheshire, CW10 0HS UK

49 and 60 Jonergin Drive, Swanton, VT 05488

### Offices

1046 18th Ave SE, Calgary, Alberta T2G 1L6

Uribitarte no 18, 6ª planta, Bilbao, Spain 48001

1710 23rd Avenue, Gulfport, MS 39501

2200 Sciaaca Road, Spring, TX 77373

12337 Jones Road, Suite 320, Houston, TX 77070

C/ Londres, 38, Oficina 204 Edificio Bruselas
28232 - Las Rozas De Madrid (Madrid) Spain

Avda. Nueva Providencia 1363 Oficina 304
Providencia, Santiago De Chile, Chile

4 Commerce Street, Suite A-2, Poughkeepsie, NY 12603

# APPENDIX E

## Letter - Payment & Performance Bond and Warranty Obligations

## (Envelope 1)

Liberty Mutual SURETY

# CONSENT OF SURETY

**BDTO-470002-024-002**

We, the undersigned, Liberty Mutual Insurance Company, a corporation organized and existing under the laws of the State of Massachusetts and authorized to do business in the State of Oregon with offices at 2200 Renaissance Blvd., suite 400 King of Prussia, PA. 19406

do hereby consent and agree with City Of Sandy

that if the foregoing proposal of H2O INNOVATION USA, INC.

for CITY OF SANDY, ALDER CREEK WATER TREATMENT PLANT UPGRADE PROJECT - 2002006267

be accepted and the contract be timely awarded and executed by City Of Sandy

we will, upon its being so awarded and entered into, become surety for the said CITY OF SANDY, ALDER CREEK WATER TREATMENT PLANT UPGRADE PROJECT - 2002006267 - a Performance and Payment bond each in a sum not to exceed ONE HUNDRED PERCENT (100%) OF THE PRICE OF THE CONTRACT - including a mechanical warranty period of one year (maintenance bond)

for the faithful performance of said contract.

Signed, sealed and dated this 13th day of March, 2024.

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

Liberty Mutual Insurance Company

By _____
Lisa Betancur — Attorney-in-Fact

LMS-10997 10/99

Liberty Mutual SURETY

**This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.**

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8210551-969099**

# POWER OF ATTORNEY

**KNOWN ALL PERSONS BY THESE PRESENTS:** That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Lisa Betancur, Donna Marie Borja, Alison Chambers, David W. Garese, Robert J. Garese, Maria Pamela Duran Rufino, A. Catherine Skeen, Brooke A. Skeen

all of the city of Sacramento state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

**IN WITNESS WHEREOF,** this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 4th day of August, 2023.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 4th day of August, 2023 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

**IN WITNESS WHEREOF,** I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2025
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

**ARTICLE IV – OFFICERS:** Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

**ARTICLE XIII – Execution of Contracts:** Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

**Certificate of Designation** – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

**Authorization** – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

**IN TESTIMONY WHEREOF,** I have hereunto set my hand and affixed the seals of said Companies this 13th day of March, 2024.

By: _____
Renee C. Llewellyn, Assistant Secretary

# ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Sacramento )

On March 13, 2024 before me, Donna Marie Borja, Notary Public
(insert name and title of the officer)

personally appeared Lisa Betancur,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

DONNA MARIE BORJA
COMMISSION #2430459
NOTARY PUBLIC - CALIFORNIA
SOLANO COUNTY
MY COMMISSION EXPIRES
DECEMBER 12, 2026

Signature Donna Marie Borja (Seal)

# APPENDIX F

## **Insurance** Broker Letter

## (Envelope 1)

5700, boul. des Galeries, bur. 200, Québec (Québec
T 418 659-4848 / 1 800 463-2830 - F 41

*Item # 3.*

# CERTIFICATE OF INSURANCE

**Certificate no 206**

**This certificate is issued as a matter of information only and, unless otherwise set forth herein, grants no right upon the certificate holder. This certificate does not amend, extend nor modify in any way the coverage afforded by the policies below. In the event of conflict between this certificate and the terms and conditions of the insurance policies it evidences, the latter shall prevail.**

| CERTIFICATE HOLDER | NAMED INSURED |
|---|---|
| **Evidence of coverage** | **H2O Innovation Inc. and all subsidiaries**<br>340-330 rue Saint-Vallier Est<br>Quebec, QC G1K 9C5 |

**This is to certify that the policies of insurance listed below have been issued to the above Named Insured for the policy period indicated. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies. Limits shown may have been reduced by paid claims.**

| TYPE OF INSURANCE | INSURANCE LIMITS | INSURER(S) | POLICY(IES) N° | PERIOD (MM/DD/YYYY) |
|---|---|---|---|---|
| **Comprehensive General Liability**<br>(X) Occurrence basis<br>( ) Claims made basis<br>Per occurrence<br>General aggregate<br>Products/completed operations, aggregate<br>Personal injury and advertising liability<br>Tenant's legal liability<br>Medical Expenses<br>Non-owned automobile Q.P.F. N° 6 | | | | |
| **Property insurance**<br>Limit | See below (1) | CNA | 6072909646 | From: 11/01/2023<br>To: 11/01/2024 |
| **Property Insurance ''All Risks'' and Boiler & Machinery**<br>Limit | See below (2) | Intact Insurance | 376-1866 | From: 11/01/2023<br>To: 11/01/2024 |
| | | | | |
| | | | | |
| | | | | |

**NATURE AND PURPOSE OF THE CERTIFICATE**

All premises and operations of the Insured including the following :

(1) - Covered Location : 330, rue St-Vallier Est, suite 340, Quebec, QC

Limit on property : 1,331, 000 $

Limit on Extra expense : 500 000 $

(2) - Limit on tools : 50 000 $

Limit on leased equipment (30 days) : 50 000 $

Limit on property : Covered locations / Limit on Property / Limit on extra expense

201, 1ère Avenue, Ham Nord,Qc / $11,851,000 / $500,000

220, 1ère Avenue, Ham Nord,Qc / $500,000 / $100,000

215, 1ère Avenue, Ham Nord,Qc / $485,000 / $100,000

136 rue VTL, Saint-Louis-du-Ha!Ha!, Qc / $465,000 / $100,000

1046, 18th Avenue, South East, Calgary,AB / $280,000 / $100,000

827 route 161, Ham Nord,Qc / $3,245,000 / $100,000

**SPECIAL PROVISIONS**

**CANCELLATION**

Should any of the above described policies be cancelled before the expiration date thereof, the insurer (s) will endeavor to mail -- days written notice to the Certificate Holder, but failure to m ail such notice shall impose no obligation or liability of an y kind upon either the Insurer (s).

**Date**: 11/1/2023

Marc-André Laflamme, B.C.L., LL.B.
**Authorized Representative**

5700, boul. des Galeries, bur. 200, Québec (Québec
T 418 659-4848 / 1 800 463-2830 - F 41

Item # 3.

# CERTIFICATE OF INSURANCE

**Certificate no 216**

**This certificate is issued as a matter of information only and, unless otherwise set forth herein, grants no right upon the certificate holder. This certificate does not amend, extend nor modify in any way the coverage afforded by the policies below. In the event of conflict between this certificate and the terms and conditions of the insurance policies it evidences, the latter shall prevail.**

| CERTIFICATE HOLDER | NAMED INSURED |
|---|---|
| **Evidence of coverage** | **H2O Innovation Operation & Maintenance, LLC**<br>340-330 rue Saint-Vallier Est<br>Quebec, QC G1K 9C5 |

**This is to certify that the policies of insurance listed below have been issued to the above Named Insured for the policy period indicated. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies. Limits shown may have been reduced by paid claims.**

| TYPE OF INSURANCE | INSURANCE LIMITS | INSURER(S) | POLICY(IES) N° | PERIOD (MM/DD/YYYY) |
|---|---|---|---|---|
| **Comprehensive General Liability** | | | | |
| (X) Occurrence basis | | | | |
| ( ) Claims made basis | | | | |
| Per occurrence | 2 000 000 USD | | | |
| General aggregate | N/A | XL Insurance Company SE | CA00001719LI23A | From: 05/01/2023 |
| Products/completed operations, aggregate | 2 000 000 USD | | | To: 05/01/2024 |
| Personal injury and advertising liability | 2 000 000 USD | | | |
| Tenant's legal liability | 2 000 000 USD | | | |
| Medical Expenses | 25 000 USD | | | |
| Non-owned automobile Q.P.F. N° 6 | 2 000 000 USD | | | |
| **Excess Liability** | | | | |
| ( X ) Excess of automobile liability | | | | |
| ( X ) Excess of Comprehensive General Liability | | NovaRisk on behalf of Trisura | NRC3200010-U | From: 05/01/2023 |
| ( X ) Excess of Employers Liability | | | | To: 05/01/2024 |
| Per occurrence | 3 000 000 USD | | | |
| General aggregate | 3 000 000 USD | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**NATURE AND PURPOSE OF THE CERTIFICATE**

All premises and operations of the Insured.

**SPECIAL PROVISIONS**

**CANCELLATION**

Should any of the above described policies be cancelled before the expiration date thereof, the insurer (s) will endeavor to mail -- days written notice to the Certificate Holder, but failure to m ail such notice shall impose no obligation or liability of an y kind upon either the Insurer (s).

**Date**: 4/26/2023

Marc-André Laflamme, B.C.L., LL.B.
**Authorized Representative**

5700, boul. des Galeries, bur. 200, Québec (Québec
T 418 659-4848 / 1 800 463-2830 - F 41

*Item # 3.*

# CERTIFICATE OF INSURANCE

**Certificate no 351**

**This certificate is issued as a matter of information only and, unless otherwise set forth herein, grants no right upon the certificate holder. This certificate does not amend, extend nor modify in any way the coverage afforded by the policies below. In the event of conflict between this certificate and the terms and conditions of the insurance policies it evidences, the latter shall prevail.**

| CERTIFICATE HOLDER | NAMED INSURED |
|---|---|
| **Evidence of coverage** | **H2O Innovation Inc. and all its subsidiaries**<br>340-330 rue Saint-Vallier Est<br>Quebec, QC G1K 9C5 |

**This is to certify that the policies of insurance listed below have been issued to the above Named Insured for the policy period indicated. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies. Limits shown may have been reduced by paid claims.**

| TYPE OF INSURANCE | INSURANCE LIMITS | INSURER(S) | POLICY(IES) N° | PERIOD (MM/DD/YYYY) |
|---|---|---|---|---|
| **Comprehensive General Liability**<br>(X) Occurrence basis<br>( ) Claims made basis<br>Per occurrence<br>General aggregate<br>Products/completed operations, aggregate<br>Personal injury and advertising liability<br>Tenant's legal liability<br>Medical Expenses<br>Non-owned automobile Q.P.F. N° 6 | | | | |
| **Architects & Engineers Errors and omissions Liability**<br>Per claim<br>Aggregate | <br>2 000 000<br>2 000 000 | Various Lloyd's Underwriters through REVAU | P23A370439P | From: 05/01/2023<br>To: 05/01/2024 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**NATURE AND PURPOSE OF THE CERTIFICATE**

All premises and operations of the Insured.

**SPECIAL PROVISIONS**

**CANCELLATION**

Should any of the above described policies be cancelled before the expiration date thereof, the insurer (s) will endeavor to mail -- days written notice to the Certificate Holder, but failure to m ail such notice shall impose no obligation or liability of an y kind upon either the Insurer (s).

**Date**: 4/26/2023

Marc-André Laflamme, B.C.L., LL.B.
**Authorized Representative**

# CERTIFICATE OF LIABILITY INSURANCE

DATE 12/19/2023

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

| PRODUCER | CONTACT NAME: Kimberly Shows |
|---|---|
| Hub International Gulf South<br>1311 Spring Street, Suite A<br>Gulfport, MS 39507 | PHONE (A/C, No, Ext): (601) 607-5582 FAX (A/C, No):<br>E-MAIL ADDRESS: kimberly.shows@hubinternational.com |

| INSURED | INSURER(S) AFFORDING COVERAGE | NAIC # |
|---|---|---|
| H2O Innovation USA, Inc.<br>330 Rue St-Vallier Est, Suite 340<br>Quebec, QC G1K 9C5<br>CANADA | INSURER A : XL Insurance America, Inc | 24554 |
| | INSURER B : Hudson Insurance Company | 25054 |
| | INSURER C : Upland Specialty Insurance Company | 16988 |
| | INSURER D : Everest Indemnity Insurance Company | 10851 |
| | INSURER E : ACE American Insurance Company | 22667 |
| | INSURER F : | |

**COVERAGES** **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

| INSR LTR | TYPE OF INSURANCE | ADDL INSD | SUBR WVD | POLICY NUMBER | POLICY EFF (MM/DD/YYYY) | POLICY EXP (MM/DD/YYYY) | LIMITS | |
|---|---|---|---|---|---|---|---|---|
| A | X COMMERCIAL GENERAL LIABILITY<br>CLAIMS-MADE X OCCUR<br>GEN'L AGGREGATE LIMIT APPLIES PER:<br>X POLICY PRO-JECT LOC<br>OTHER: | X | X | US00011386LI23A | 5/1/2023 | 5/1/2024 | EACH OCCURRENCE<br>DAMAGE TO RENTED PREMISES (Ea occurrence)<br>MED EXP (Any one person)<br>PERSONAL & ADV INJURY<br>GENERAL AGGREGATE<br>PRODUCTS - COMP/OP AGG<br>EMPLOYEE BENEFI | $ 1,000,000<br>$ 100,000<br>$ 10,000<br>$ 1,000,000<br>$ 1,000,000<br>$ 1,000,000<br>$ 1,000,000 |
| B | AUTOMOBILE LIABILITY<br>X ANY AUTO<br>OWNED AUTOS ONLY SCHEDULED AUTOS<br>X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY | | X | HST00016503 | 11/15/2023 | 11/15/2024 | COMBINED SINGLE LIMIT (Ea accident)<br>BODILY INJURY (Per person)<br>BODILY INJURY (Per accident)<br>PROPERTY DAMAGE (Per accident) | $ 2,000,000<br>$<br>$<br>$ |
| C | X UMBRELLA LIAB X OCCUR<br>EXCESS LIAB CLAIMS-MADE<br>DED RETENTION $ | | | USXTL0490823 | 11/15/2023 | 11/15/2024 | EACH OCCURRENCE<br>AGGREGATE | $ 1,000,000<br>$ 1,000,000 |
| D | WORKERS COMPENSATION AND EMPLOYERS' LIABILITY<br>ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N<br>(Mandatory in NH)<br>If yes, describe under DESCRIPTION OF OPERATIONS below | N / A | X | EN4WC00382231 | 11/15/2023 | 11/15/2024 | X PER STATUTE OTH-ER<br>E.L. EACH ACCIDENT<br>E.L. DISEASE - EA EMPLOYEE<br>E.L. DISEASE - POLICY LIMIT | $ 1,000,000<br>$ 1,000,000<br>$ 1,000,000 |
| E | Pollution / Environm | | | G28316033003 | 5/1/2023 | 5/1/2024 | Pollution | 5,000,000 |

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

**Named Insured(s):**
**H2O Innovation USA Holding, Inc.;**
**H2O Innovation USA, Inc.;**
**Piedmont Pacific Corporation;**
**Professional Water Technologies, LLC;**
**Utility Partners, LLC;**
**Hays Utility South Corp.;**
**SEE ATTACHED ACORD 101**

**CERTIFICATE HOLDER**

For Informational Purposes Only

**CANCELLATION**

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Greg Cullom

# ADDITIONAL REMARKS SCHEDULE



| AGENCY | NAMED INSURED |
|---|---|
| Hub International Gulf South | H2O Innovation USA, Inc.<br>330 Rue St-Vallier Est, Suite 340<br>Quebec, QC G1K 9C5<br>CANADA |
| POLICY NUMBER<br>SEE PAGE 1 | |
| CARRIER: SEE PAGE 1 / NAIC CODE: SEE P 1 | EFFECTIVE DATE: SEE PAGE 1 |

**ADDITIONAL REMARKS**

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: ACORD 25 FORM TITLE: Certificate of Liability Insurance

**Description of Operations/Locations/Vehicles:**
**H2O Innovation Operations & Maintenance, LLC**
**Environmental Consultants, LLC**
**JCO, Inc.**

**Automobile Policy:**
**Waiver of Transfer of Rights of Recovery Against Others To Us (Waiver of Subrogation) - Blanket CA 04 44 10 13 Additional Insured**

**Lessor - Additional Insured and Loss Payee - Blanket CA 20 01 10 13**

**Workers Compensation Policy:**
**Longshore/Harbor Workers Compensation Act WC040101A 04/92**

**Waiver of our Right to Recover WC00313 04/84**

**Applies to All states and U.S. territories except monopolistic states, Puerto Rico, the U.S. Virgin Islands**

**Excess Auto Liability Policy:**
**Waiver of Subrogation GT1095**

**General Liability Policy:**
**Blanket Additional Insured – Owners Lessees or Contractors CG 20 10 (12 19) – As required by a written contract or written agreement**

**Blanket Additional Insured- Designated Person or Organization CG 20 26 (12 19)- As required by a written contract or written agreement**

**Blanket Additional Insured – Owners, lessees or Contractors – Schedule Person or Organization – Products and Completed Operations CG 20 37 (12 19) – As required by a written contract or written agreement**

**Additional Insured – Owner, Lessees or Contractors – Automatic Status for Other Parties when required in Written Contract CG 20 38 (12 19)**

**Primary and Non Contributing Clause XIL 424 (06 05) applies to the policies referenced on the COI when required by written contract**

**Stop Gap – Employers Liability Coverage Endorsement- Washington CG 04 42 (11 03)**

**Stop Gap – Employers Liability Coverage Endorsement – Ohio CG 04 41 (03 14)**

**Waiver of Rights of Recovery Against Others to Us CG 24 04 (12 19) – As required by a written contract**

**H2O Innovation USA, Inc. dba Leader Evaporator has WC, GL and Auto insurance for all operations, property, vehicles and employees of Leader Evaporator.**

# APPENDIX G

## Agreement Form Acknowledgement

FORM OF AGREEMENT

## (Envelope 1)

Submitted to: City of Sandy, Oregon

Project: City of Sandy
Alder Creek Water Treatment Plant Upgrade
Membrane Equipment Procurement

## LETTER OF AKNOWLEDGMENT – FORM OF AGREEMENT

I, the undersigned Fraser Kent, Vice President of Capital Equipment Sales-Water Technologies & Services of $H_2O$ Innovation USA, Inc., a corporation organized and existing under the laws of Delaware ("**$H_2O$ Innovation**"), hereby declare and certify that $H_2O$ Innovation will comply with the terms stipulated under SECTION 00 52 00 of the specifications and tender documents ("**Procurement Agreement**"), subject to the clarifications stated in the commercial proposal documents submitted by $H_2O$ Innovation for the Project, the whole pursuant to article 2.02 of the Procurement Agreement.

We shall remain available to discuss the proposed classifications and reach a mutually beneficial agreement that would be satisfactory for both parties should $H_2O$ Innovation be selected as the successful bidder.

Best regards.

Signed this 1st day of April 2024.

Fraser Kent
Vice President of Capital Equipment Sales - Water Technologies & Services

# APPENDIX H

# Copy of Proposal Documents

# (Envelope 1)

April 2, 2024



# ALDER CREEK WTP UPGRADE, CITY OF SANDY, OR

Inquiry No.: 2002006267 – Sandy Program Management (Envelope 1)

PROPOSAL # U5588

REVISION # 0

DATE 04/11/2024

**SUBMITTED TO**

JENNY COKER, PE
PUBLIC WORKS DIRECTOR OF ENGINEERING
39250 PIONEER BLVD.,
CITY OF SANDY, OR 97055
503.668.6927
jcoker@ci.sandy.or.us

**SUBMITTED BY**

SHAYAN YAGHOUBI
H2O INNOVATION USA, INC.
1048, LA MIRADA COURT,
VISTA, CALIFORNIA 92081
760.598.2206
Shayan.Yaghoubi@h2oinnovation.com

April 2, 2024



# ALDER CREEK WTP UPGRADE, CITY OF SANDY, OR

Inquiry No.: 2002006267 – Sandy Program Management (Envelope 2)

PROPOSAL # U5588

REVISION # 0

DATE 04/11/2024

**SUBMITTED TO**

JENNY COKER, PE
PUBLIC WORKS DIRECTOR OF ENGINEERING
39250 PIONEER BLVD.,
CITY OF SANDY, OR 97055
503.668.6927
jcoker@ci.sandy.or.us

**SUBMITTED BY**

SHAYAN YAGHOUBI
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760.598.2206
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SANDY
WHERE INNOVATION MEETS ELEVATION

39250 P
Sandy, OR 97055
503-668-5533

April 2, 2024

**ADDENDUM NO. 1**
**TO THE REQUEST FOR PROPOSAL**
**DOCUMENTS FOR PROJECT NO. SDWRP-02-24**

**CITY OF SANDY**

**MEMBRANE EQUIPMENT FOR UPGRADED WATER TREATMENT PLANT**

This addendum, issued on the **22nd day of February 2024,** affects the request for proposal documents for the **Membrane Equipment for Upgraded Water Treatment Plant Project No. SDWRP-02-24** and shall be deemed an integral part of the above referenced documents.

## CLARIFICATIONS

**Revision to Specification:**

**SECTION 11 30 00 – CONTAINERIZED HOLLOW FIBER MEMBRANE EQUIPMENT MEMBRANE TREATMENT SYSTEM** revised to remove WestTech from list of acceptable sellers and DuPont IntegraTec XP 77 IG from pre-qualified membrane modules and membrane element manufacturers.

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39250 P
Sandy, OR 97055
503-668-5533

April 2, 2024

**ADDENDUM NO. 2**
**TO THE REQUEST FOR PROPOSAL**
**DOCUMENTS FOR PROJECT NO. SDWRP-02-24**

**CITY OF SANDY**

**MEMBRANE EQUIPMENT FOR UPGRADED WATER TREATMENT PLANT**

This addendum, issued on the **22nd day of February 2024,** affects the request for proposal documents for the **Membrane Equipment for Upgraded Water Treatment Plant Project No. SDWRP-02-24** and shall be deemed an integral part of the above referenced documents.

## CLARIFICATIONS

**Proposal Deadline Extension:**

Request for Proposals deadline extended from the original 2:00 PM Pacific Time on March 14th, 2024, to **2:00 PM Pacific Time on March 28th, 2024.**

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39250 P
Sandy, OR 97055
503-668-5533

April 2, 2024

**ADDENDUM NO. 3**
**TO THE REQUEST FOR PROPOSAL**
**DOCUMENTS FOR PROJECT NO. SDWRP-02-24**

**CITY OF SANDY**

**MEMBRANE EQUIPMENT FOR UPGRADED WATER TREATMENT PLANT**

This addendum, issued on the **5th day of March 2024,** affects the request for proposal documents for the **Membrane Equipment for Upgraded Water Treatment Plant Project No. SDWRP-02-24** and shall be deemed an integral part of the above referenced documents.

## CLARIFICATIONS

**Question #1:**

Anticipated coagulant dose in the feed water. This information is required in establishing MF flux design.

**Response: #1**

Anticipated coagulate dose maybe 1-3 mg/l (as product) during most periods. The dose may be 3-9 mg/l during stormy weather with high runoff and elevated TSS, which would coincide with low water demand.

---

**Question #2:**

The specification has quoted for Drawing I-001 to Drawing I-006. These drawings have not been attached in the specifications. These is drawings are referenced in the specifications and are required in the interpretation of specification context.

**Response #2**

The Conceptual Design Report is now included, which contains Process flow Diagrams to be used as reference.

---

**Question #3**

After reviewing SECTION 01 33 17 and SECTION 11 30 00 of the specification, Buyer would like to clarify that the PE signed seismic calculations and anchor bolt calculations can be provided for the containerized systems itself, and external tanks. The seismic calculations are not possible for internal equipment, mechanical and electrical components of the containerized system and the interconnecting piping between the containerized systems. Seismic calculations on the internal equipment of the containerized system may require serious work on the containerized equipment and is not Aria Filtra's standard offering. Please allow for the seismic calculations of the complete containerized systems and external tanks only.

---

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39250 P
Sandy, OR 97055
503-668-5533

April 2, 2024

**ADDENDUM NO. 4**
**TO THE REQUEST FOR PROPOSAL**
**DOCUMENTS FOR PROJECT NO. SDWRP-02-24**

**CITY OF SANDY**

**MEMBRANE EQUIPMENT FOR UPGRADED WATER TREATMENT PLANT**

This addendum, issued on the **18th day of March 2024,** affects the request for proposal documents for the **Membrane Equipment for Upgraded Water Treatment Plant Project No. SDWRP-02-24** and shall be deemed an integral part of the above referenced documents.

## CLARIFICATIONS

**Proposal Deadline Extension:**

Request for Proposals deadline extended from the amended 2:00 PM Pacific Time on March 28th, 2024, to **2:00 PM Pacific Time on April 11th, 2024.**

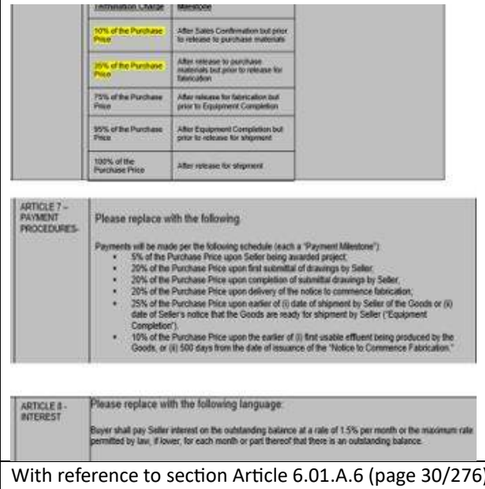
**ADDENDUM NO. 5**
**TO THE REQUEST FOR PROPOSAL**
**DOCUMENTS FOR PROJECT NO. SDWRP-02-24**

**CITY OF SANDY**

**MEMBRANE EQUIPMENT FOR UPGRADED WATER TREATMENT PLANT**

This addendum, issued on the **19th day of March 2024,** affects the request for proposal documents for the **Membrane Equipment for Upgraded Water Treatment Plant Project No. SDWRP-02-24** and shall be deemed an integral part of the above referenced documents.

## CLARIFICATIONS

| No. | Specification Reference | | Comment Category | Specification Statement of Concern | Disposition | Comments | Stantec Response | Specification Modified |
|---|---|---|---|---|---|---|---|---|
| | Section | Page | | | | | | |
| | 00 52 00<br>00 80 50 | | |  | | | No changes made. Seller will be provided with compensation for shop drawing and submittal development. 18% APR is excessive. Not accepted | No spec modification. |
| | **With reference to section Article 6.01.A.6 (page 30/276):** | | | With reference to section Article 6.01.A.6 (page 30/276): we will include the commercial exceptions and clarifications in our proposal document, and we would be happy to address these during negotiation phase later provided we are selected as the successful bidder. Please confirm if this approach is acceptable and will not impact the scoring for evaluation/selection purposes.<br><br>6. Letter from an officer of Proposers firm stating that proposer takes no exceptions to the Form of Agreement. | | | We believe Article 2, 2.02, allows you to submit the letter and still provide exceptions.<br><br>*The Buyer will execute the Agreement, subject to Seller's exceptions herein, and administer the Contract for Special Engineering Services associated with the preparation of Shop Drawings and other* | No spec modification. |

# APPENDIX I

# Draft Pilot Test Plan

# (Envelope 1)

# ALDER CREEK WTP UPGRADE, CITY OF SANDY, OR

# MEMBRANE FILTRATION DRAFT PILOT PROTOCOL

**Date: March 22nd, 2024**

**Revision Number: 0**


**Submitted To**

Jenny Coker, PE
Public Works Director
City of Sandy, OR 97055

503-668-6927

jcoker@ci.sandy.or.us

**Submitted by**

Shayan Yaghoubi
Regional Sales Manager
H2O Innovation

619-884-5834

shayan.yaghoubi@h2oinnovation.com

# TABLE OF CONTENTS

## SECTION 1 – INTRODUCTION

The following document constitute a draft example of the pilot protocol to be used on this project.

$H_2O$ Innovation is pleased to provide the following pilot protocol for pilot testing the HFUG-2020AN UF membrane modules as a to be used on Alder Creek source water at the City of Sandy, Oregon designated future WTP site.

The pilot program will serve to demonstrate UF membrane system performance under the design and operating conditions proposed by $H_2O$ Innovation.

A skidded immersed UF membrane pilot system, referred to as the FiberFlex™, is being provided by $H_2O$ Innovation for the pilot test period, targeted to begin in Spring 2024 and would extend into the Summer of 2024 for 90 days. The pilot system will be equipped with automatic controls and necessary functionality, including Intelogx for remote access and monitoring capability.

The pilot system will be housed within a container. It will be fed by a submersible pump from Alder Creej source water. Waste streams generated by the pilot, including the treated filtrate, will be sent to drain where the plant currently disposes of neutralized cleaning waste and backwash waste.

A brochure of the FiberFlex™ pilot system is included as Appendix K to the main proposal document.

A technical data sheet of the HFUG-2020AN membrane modules being used on the pilot is provided in Appendix J.

## SECTION 2 – APPROACH AND OBJECTIVES

The objectives of the pilot will be to demonstrate the following

- Performance requirements such as chemical usage, capacity (flux), recovery and cleaning frequency. Demonstrated flux will be used to confirm capacity of the full-scale WTP.
- Stable and predictable membrane performance throughout the entire pilot duration.
- Ability of the UF membranes to be cleaned and recovering permeability. A minimum of three CIPs will be performed throughout the pilot program (1 per phase).
- Ability of the UF membrane to maintain integrity as demonstrated through filtrate turbidity monitoring as well as through daily Membrane Integrity Testing (MIT).
- Prove other operating parameters for the full-scale facility based on the performance of the membranes during the pilot (maximum TMP, maximum pressure, permeability restoration, post-CIP fouling rate).

The pilot program will be conducted over three phases.

Phase I is for startup and commissioning of the pilot system. This period will provide an opportunity for tuning of control systems, calibration of instrumentation, and implementation of the data collection procedures. Training of Buyer's staff will occur during this time period. The Quality Assurance program shall be initiated, including verification of data collection and reporting systems.

During Phase II, the UF System will be run at the conditions as bid in the Proposal. All performance criteria specified shall be met greater than or equal to 95 percent of the time throughout the duration of this phase for the phase to be deemed successful.

Phase III consists of a repeat of Phase II for confirmation.

At the conclusion of the pilot, a Final Pilot Summary Report will be generated. This report shall include, but not be limited to, an introduction of the existing treatment and pilot study; description of operation; presentation and discussion of results; conclusions and recommendations drawn from the study; and associated test data, tables, and graphs. The final report shall include information listed in Part 5

Piloting operations and performance monitoring will be provided on-line through $H_2O$ Innovation's Intelogx package.

# SECTION 3 – SYSTEM DESCRIPTION

## 3.1 EQUIPMENT DESCRIPTION

The UF pilot is based on supplying our FiberFlex™ pilot skid and will include the following equipment:

- Loose shipped submersible pump with 20' hose and couplings
- Flow paced Coagulant dosing equipment
- Automatic strainer
- Coagulation/Flocculation tank
- UF membrane feed pump
- One (1) Toray HFUG-2020AN UF module of 90 $m^2$ (969 $ft^2$)
- Filtrate tank and backpulse pump
- UF/NF breaktank (hydraulically connected to filtrate tank), with excess UF filtrate overflowing to drain via gravity connection
- UF CIP pump and tank, complete with tank heater
- Membrane chemical cleaning dosing pumps and associated equipment:
    - Sodium hypochlorite for maintenance and recovery cleans
    - Citric Acid for recovery cleans
    - Sodium hydroxide for neutralization
    - Sodium bisulfite for neutralization
- Waste disposal to drain via gravity connection
- Air compressor system for instrument air, backwash air scour, and Membrane Integrity Tests
- Instrumentation and pneumatically operated valves per attached P&IDs
- Compressed air equipment

The electrical and control system for the UF pilot includes the following features:

- Intelogx platform for remote access and performance monitoring
- PLC/HMI system along with the following automated data logging through Intelogx:
    - UF feed and permeate flow rate
    - UF backpulse flow rate
    - UF feed and permeate pressure for the calculation of the transmembrane pressure
    - UF feed temperature
    - UF feed turbidity
    - UF permeate turbidity
    - UF MIT starting pressure and associated pressure decay rate through the permeate pressure transmitter
- Electrical requirements: 480VAC/ 150 AMPS (please refer to Section 3.4 for details on power feed to the pilot system)

P&IDs of the UF pilot system as well as Pilot data sheets have been included in Appendix K.

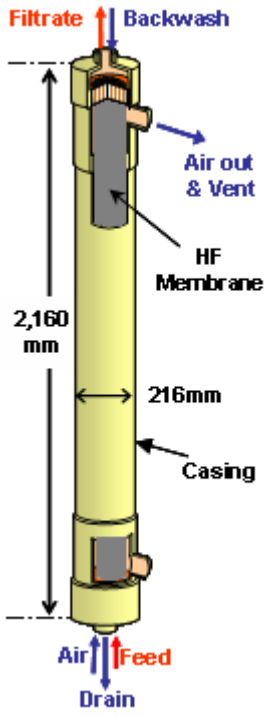
The pilot equipment will be housed in the water treatment plant building. Piping that extends outside the plant is to be installed, insulated and heat traced by the City.

$H_2O$ Innovation will be using the INTELOGX™ platform for purposes of data logging, trending and remote monitoring. Please refer to section 6.7 of attached proposal (Alder Creek WTP UPGRADE, City of Sandy, OR – U5588) for further information.

## 3.2 OPERATING DESCRIPTION

H2O Innovation will be providing a submersible raw water pump for purposes of feeding the H2O Innovation pilot system. The feed pump would be located in the Raw Water Manhole and powered and controlled from the UF FilberFlex™ skid. As such, the raw water pump is to be supplied as 480V, 3 phase.

Raw water enters the feed piping of the UF pilot skid, where pre-treatment chemicals (coagulant) are added in-line as required. Raw water passes through an automatic strainer and then flows into the pilot system's feed/flocculation tank. Feed water is pumped from the flocculation tank to the membrane modules at a maximum feed pressure of 45 psi. Each UF module acts as an independent train in the sense that flow and pressure is monitored separately, and each module has independent flow (flux) and recovery setpoints that are adjustable as inputs at the HMI.




Particulate matter, including Virus, Giardia cysts and Cryptosporidium oocysts, remain on the outside of the membrane fiber while permeate goes through to the inside of the hollow fibers and exits the top port of the membrane module. The filtration cycle continues for approximately 20-45 minutes, depending on recovery and flux. After each filtration cycle, particulates and suspended solids are removed from the module using a backwash cycle. In the backwash cycle, feed to the module stops and filtrate from the backpulse supply tank is directed into the hollow fibers for approximately 30 seconds. The top-side port is open allowing the excess water to overflow to drain. Next, air bubbles scour the membranes for 30 seconds and then the module is drained via gravity to waste (note: a gravity drain is imperative without any backpressure to ensure complete emptying of the module). The overall backwash cycle requires approximately 3 to 3.5 minutes.

Filtrate that is produced by the UF modules is directed to the UF filtrate tank which serves as a reservoir to supply backpulse for the backwash sequence.

Maintenance cleans will performed on the UF modules on a routine basis. Maintenance cleans are initiated after the backwash cycle and involve recirculating the concentrated chemical solution through the module for approximately 20 minutes. Following the clean, the spent cleaning solution is returned to the CIP tank, and the spent solution is sent to drain.

Waste generated from the UF backwash events as well as spent cleaning waste would be drained via gravity to the Sludge Pumping Station located outside the plant building.

Recovery cleans are performed when the TransMembrane Pressure (TMP) approaches the maximum allowed on the membrane (29 psi) or based on a cleaning interval duration that is specific to the application. Recovery cleans are similar to maintenance cleans except the recirculation period is longer and the chemical concentration is higher. The solution is also typically heated to 40°C to enhance the cleaning efficiency. Typical duration for a recovery clean is 4 to 5 hours.

During periods when the UF system is undergoing chemical cleans, the NF pilot would be temporarily shutdown.

Membrane Integrity Tests (MITs) are performed on a daily basis by pressurizing the module with compressed air on the feed side of the fiber at a pressure of approximately 15 psi. Once the water has been purged from the system the pressure in the module is monitored and recorded to evaluate the membrane integrity. At the end of the test the air is purged and the system returns to normal operation. The test lasts approximately 15 minutes. The Log Removal Value (LRV) of the membrane is then calculated for the integrity test based on the pressure decay and operating parameters.

The data logging for the membrane flux and transmembrane pressure will be centered around the backwash events. For each backwash, the system will log the flow and pressure a few minutes before the backwash, during the backwash and a few minutes after the backwash (during the production cycle). This will provide insight into the performance of the backwash cycle and help in the optimization of the system. Turbidity (feed and permeate) will be logged continuously every minute.

The UF pilot will require a minimum feed flow rate of approximately 27 gpm. The submersible raw water feed pump should be sized between 35 and 40 gpm to allow flexibility on cycling of the feed tank. Coagulant dosing will be flow paced to the submersible raw water pumping rate. The UF pilot will generate a maximum instantaneous waste rate of just under 20 gpm during the backpulse step of the backwash sequence. Like the full scale facility, the pilot will operate in dead-end mode. In other words, during filtration all the feed water is converted to permeate and there is no waste generated by the system. The backwash waste is only generated intermittently during the backwash.

The recovery will be maintained constant at the setpoint entered at the HMI (93 to 91% for the UF system). The recovery setpoint will drive the actual duration of the production cycle. Water quality in terms of feed and filtrate turbidity will be logged continuously every 15 minutes. Filtrate turbidity

is expected to be less than 0.1 NTU 99% of the time. On a daily basis, the system would undergo a MIT, confirming greater than 3.5-log removal of cryptosporidium and giardia.

## 3.3 MEMBRANE CHARACTERISTICS

H2O Innovation will supply the Toray HFUG-2020AN UF module as was offered in our proposal.

A data sheet for the module has been included as Appendix J.

## 3.4 PILOT UTILITY AND CHEMICAL REQUIREMENTS (TO BE VALIDATED)

The following table provides a summary of utility requirements for the UF pilot. Please refer to P&IDs for pipe sizes at pilot equipment tie points.

| Description | Value |
|---|---|
| Raw water feed to UF pilot | 35 – 40 gpm, 40 psi total head [1] |
| UF waste to drain | Approx. 20 gpm [2] |
| Power feed to pilot system | 150 Amps at 480V, 3 Ph [3] |

1. Total head assumes a maximum of 15 feet static head from RW manhole to UF pilot's feed/flocculation tank. Head value shall be adjusted if necessary.
2. Factors in worst case including UF backwash and UF spent cleaning solution.
3. Electrical load is solely for piloting equipment and excludes any loads associate with heat tracing. The City is to supply 600V circuit/feeds. H2O Innovation will supply a transformer to convert the City's 600V, 3 phase power feed to 480V for the pilot equipment.

The following table provides estimated chemical usage on a monthly basis for the UF and NF pilots. See Appendix G for example MSDS sheets for each chemical.

| Chemical | Quantity per Month | Units |
|---|---|---|
| Coagulant | 29 | Litres |
| Sodium Hypochlorite | 15 | Litres |
| Citric Acid | 5 | Litres |
| Sodium Bisulfite | 15 | Litres |

| | | |
|---|---|---|
| Sodium Hydroxide | 15 | Litres |

1. Based on the assumed chemical supply concentrations:
   12% sodium hypochlorite
   50% citric acid
   38% sodium bisulfite
   25% sodium hydroxide
2. Coagulant is supplied as 100% neat product.
3. All chemicals supplied by the City

## SECTION 4 – PILOT PROGRAM DRAFT SCHEDULE

The following schedule is proposed, based on a 3-month pilot program.

| Date | Description |
|---|---|
| May 6, 2024 | Pilot shipment from Champlin, MN |
| May 20, 2024 | Phase 1 |
| April 20, 2024 | Phase 2 |
| June 20, 2024 | Phase 3 |
| July 20, 2024 | End of test program |
| 1st week of August 2024 | Pilot decommissioning and shipment back to Champlin, MN |

Additional information related to specific pilot operation conditions is outlined in Section 6 of the work plan.

Operator training will take place during the pilot commissioning and the optimization periods (phase 1). On-going support and training to the operator will also be provided throughout the pilot study when $H_2O$ Innovation is on site. The pilot will also be equipped with remote logging and remote access capabilities to allow $H_2O$ Innovation to assist and train the operators.

## SECTION 5 – ANALYTICAL DATA COLLECTION

Analytic data collection for the pilot has been divided into two categories including data compiled through online instrumentation and analytical testing conducted at off site laboratories.

Factory calibration certificates can be provided during commissioning phase for the pilot system instrumentation.

The following table outlines the proposed parameters to be tested along with associated frequencies:

| Parameter | | Raw Water | UF Feed | UF Filtrate | UF Backwash |
|---|---|---|---|---|---|
| Online Instruments | Flow * | 15 min (PLC) | 15 min (PLC) | 15 min (PLC) | 15 min (PLC) |
| | Temperature | | 15 min (PLC) | | |
| | Pressure | | 15 min (PLC) | 15 min (PLC) | 15 min (PLC) |
| | Turbidity | 1 min (PLC) | | 1 min (PLC) | |
| | pH | | 15 min (PLC) | | |
| | MIT (via pressure decay) | | | 1/D ** | |
| Off Site Lab Analysis | Total Manganese | 1/M | 2/M | 2/M | |
| | Dissolved Mn | 1/M | 2/M | 2/M | |
| | Total Iron | 1/M | 2/M | 2/M | |
| | Dissolved Fe | 1/M | 2/M | 2/M | |
| | TOC | 1/W | 1/W | 1/W | |
| | TSS | 1/W | 1/W | | |
| | Apparent colour | 1/W | | | |
| | True colour | | | 1/W | |

* Daily flow is also totalized for UF (feed, product, reject).
** UF modules would undergo a daily MIT, producing a calculated LRV result.
Off site lab analysis to be confirmed. Lab analysis costs to be covered by the City.
D = day, W = week, M = month

## SECTION 6 – OPERATING PROTOCOL AND PERFORMANCE GOALS

Initially, during pilot preparation and coordination, pilot shipment and laboratory contract arrangements will be made.

The proposed test conditions are outlined below. The pilot program will run for a duration of 90-days, 24-hours per day. Excluding installation, startup, maintenance, and decommissioning. but including optimization and at least two 30-day design runs with fixed operating parameters.

Membrane cleaning frequencies and cleaning recipes would apply as outlined later in this section.

The following key performance criteria will be evaluated against the design:

**Table 1 – Finished Water Quality Requirements**

| Parameter | Units | Requirement |
|---|---|---|
| MF/UF Water Quality Requirements | | |
| Total Iron | mg/L | ≤ 0.1 |
| Total Manganese | mg/L | ≤ 0.05 |
| Maximum Turbidity | NTU | < 0.1 |
| Color | Pcu | <1 |

Also more specifically:

- Turbidity
  - Maximum filtered water turbidity (ntu): 0.15
  - Maximum filtered water turbidity 95% of time (ntu): 0.10
- Microbiological Removal Efficiency
  - Minimum *Giardia* Removal: >4-log (99.99 percent)
  - Minimum *Cryptosporidium* Removal: >4-log (99.99 percent)
- Capacity (flux and flow)
- TMP and fouling profile, including average TMP, maximum and minimum TMP
- Recovery
- Chemical cleans including frequency of maintenance cleans (MC) and recovery cleans (RC), as well as TMP and permeability restoration and overall cleaning effectiveness. Includes types of chemical, chemical concentrations and chemical quantities.

The following chemical cleaning recipes are envisioned for the UF pilot.

- 150 mg/L sodium hypochlorite Maintenance Clean (MC)
- 1,000 mg/L sodium hypochlorite Recovery Clean (RC), heated to 40 degC
- 2,000 mg/L citric acid Recovery Clean (RC), heated to 40 degC.

# SECTION 7 – REPORTING

Regular performance reports will be available through the Intelogx; allowing the ability for review and comment on the ongoing pilot program. These reports are an effective tool to gauge the success of the pilot program and help determine if additional testing and data requirements may be needed.

Access to the Intelogx will also be made available to the City for 24/7 access to the data. Further information on Intelogx is provided below.

A weekly virtual meeting will be held to review data and trends in system performance. H2O will provide graphical and narrative results of the pilot test with more than 24 hour lead time before each meeting.

H2O Innovation will provide a final report upon completion of the pilot program.

## 7.1 INTELOGX™

$H_2O$ Innovation has developed a remote monitoring system called the Intelogx™, which combines early detection of any issues that may arise, system optimization, remote troubleshooting and accessibility of systems, and common data storage all into one, simple platform.

There are three tiers of Intelogx™ that can be chosen: INTELOGX™ CONNECT, INTELOGX™ STANDARD, and INTELOGX™ PLUS +.

All three tiers of Intelogx™ are equipped with remote operations. With remote operation, you have online and remote access to HMI controls in real time. This allows you to have the ability to start, stop, and adjust operating setpoints, as well as respond to alarms from virtually anywhere.

With INTELOGX™ CONNECT, data acquisition and the general status of the health can be accessed.

DATA ACQUISITION – with data acquisition, you have the ability to log all your high-value tags, store data safely on $H_2O$'s servers, archive all alarms, and check the status of every analog signal available.

With INTELOGX™ STANDARD, all of what is offered with Intelogx™ Connect is provided along with data trending.

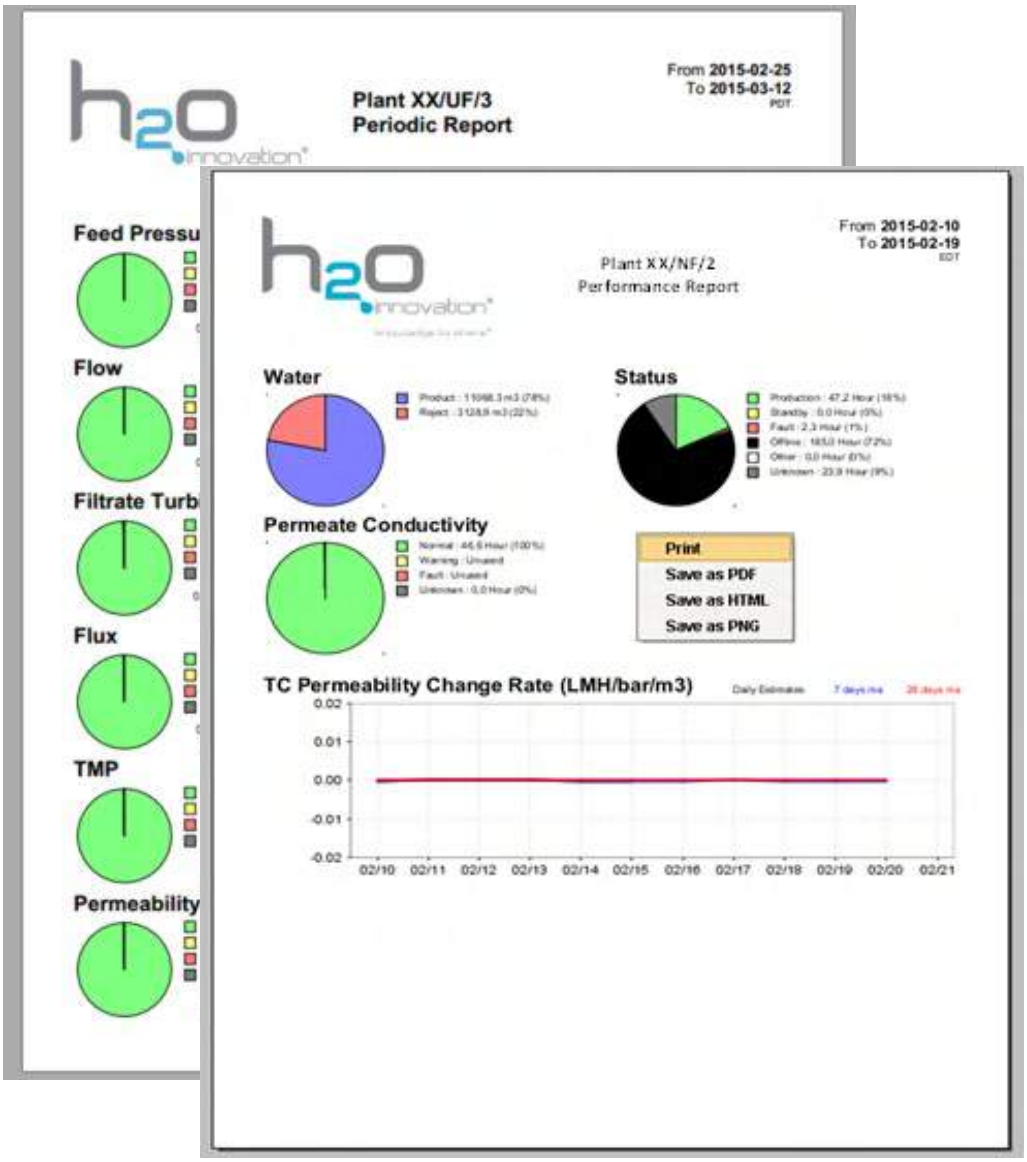
DATA TRENDING – with data trending, you can see the overall unit operation and health with graphs of the system's historical trends. In addition, plant alarm notifications can be sent via email and text message, different types of alarms can be sent to different people, and all trending and reports are available via web access.

With INTELOGX™ PLUS +, what is offered for the Intelogx™ Connect and Intelogx™ Standard is provided, along with performance analysis and suggestions for optimization.

PERFORMANCE ANALYSIS AND OPTIMIZATION - with performance analysis, monthly, and annual system performance reports can be generated, with review and analysis of the trends performed by one of our process engineers. If optimization of the system is required, our specialized technicians can provide on-site visits. Additionally, personalized and customized performance reports at set intervals can be provided.

An example of the performance reports is shown below and on the following page.

In addition to monitoring the performance of treatment equipment, our IntelogX™ system can easily be adapted to include the monitoring of plant equipment that is provided by others.




For more information on Intelogx™, please see our website at www.h2oinnovation.com.

# SECTION 8 – SCOPE OF SUPPLY

## 8.1 SCOPE OF SUPPLY BY H2O INNOVATION

For details of the mechanical setup and equipment supplied as per this study, please refer to Section 3.1.

Other items included in $H_2O$ Innovation's scope are as follows:

| Item | Note |
|---|---|
| Onsite assistance for installation, commissioning and training | Allowance for up to 20 days on site |
| In-house technical and process support | As required, based on reasonable use |
| In-house technical programming | As required, based on reasonable use |
| Intelogx performance data | Available online through Intelogx |
| Data Logging and Programming interface for remote operation | Up to 5 Login/Access created and managed |
| Programming of digital output from H2O control panel to signal start of City's raw water pump | - |
| Shut down of pilot unit and system decommissioning, re-crating of unit in original packaging | Pilot crating / packaging is to be saved and reused at end of pilot period |
| Cellular communication service for piloting duration | - |

## 8.2 SCOPE OF SUPPLY BY CITY OF SANDY

This proposal does not include the following:

| Item |
|---|
| Supply of operators for daily routine pilot operation and water quality sampling. |
| Hard wired connection from the raw water pump to the H2O pilot system. |
| Unloading, receiving and safe storage of equipment at site until ready for installation |
| Associated civil work, if required, as well as electrical wiring to connect power to pilot unit. |
| Connection and plumbing of yard piping for pilot system including feed, filtrate/permeate to drain, waste lines to drain. |
| Heat tracing and insulation of piping runs extending to and from the plant building. |
| Chemicals required for pilot operation |
| Disposal of wastewater and cleaning waste. |
| All required permits |
| Necessary safety equipment(2) |
| All required sampling and analytical work. Sampling equipment, laboratory services and fees, and courier fees if applicable. |
| Insurance for pilot equipment – valued at $350,000 |

(1) It is the responsibility of the client to ensure all safety rules are followed by its personnel during pilot operation.
(2) H2O Innovation is not liable for any injuries to personnel or property damage as they relate to the installation, operation or decommissioning of the pilot system.

# UF Pilot Report

# EXAMPLE

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**APPENDICES**

# Section 1 – Introduction and Objectives

## 1.1 Introduction

The City of Georgetown, Texas (City) intends to install a new ultrafiltration (UF) system to treat the raw water source, groundwater under the influence of surface water, at the Southside Water Treatment Plant (WTP). The Southside WTP is a direct filtration membrane treatment facility, with no pre-treatment, and treats between 1.2 and 3.6 million gallons per day (MGD). Disinfection for viruses is achieved through free chlorine and then ammonia is added to provide chloramine residual in the distribution system.

The Southside WTP treats groundwater from the Edwards Aquifer which the Texas Commission of Environmental Quality (TCEQ) has declared to be under the influence of surface water. The source water is characterized as having low turbidity (i.e., typically less than 0.1 NTU).

The new membrane system will replace the City's current ultrafiltration system that is reaching the end of its lifecycle. The pilot study is intended to characterize the UF membrane performance over the range of raw water feed conditions and confirm that the ultrafiltration system can reliably and continuously produce treated water that meets the City's treatment goals and the TCEQ treatment requirements.

In the summer of 2021, the City embarked on a hollow-fiber membrane filtration pilot study.

H2O Innovation supplied its FiberFlex™ UF piloting equipment for Georgetown Southside WTP pilot study with pilot system commissioning occurring during the week of June 28, 2021.

Throughout the study, piloting operations can be grouped in the following main phases:

- Phase 1 – Piloting optimization and fine tuning (July 14 to August 16, 2021).
- Phase 2 – Official minimum 30-day run (August 17 to September 21, 2021).
- Phase 3 – Assessment of irreversible fouling (September 22 to October 4, 2021)

The following modules were piloted along with their designated positions on the pilot unit:

- Toray HFUG-2020AN. Module position = UF1.
- Scinor SMT600-P80. Module position = UF2.
- DuPont (Dow) SFD-2880XP. Module position = UF3.

During the minimum 30-day run of the pilot, an instantaneous flux of 80 GFD was tested at 96.5% recovery on all three modules. Data was reported for key process parameters including flux, TMP and permeability. Normalized process parameters were also reported to 20 degC as per temperature correction formula outlined in the USEPA's Membrane Filtration Guidance Manual. On-line turbidity instrumentation measured permeate turbidity

for each module. Regular membrane integrity testing was performed on each module using compressed air. All LRV calculations were performed using formulas outlined in the USEPA's Membrane Filtration Guidance Manual.

This report is written to provide a summary of the performance and water quality results throughout the pilot study.

## 1.2 Objectives

The objectives of the pilot were to demonstrate the following:

- Performance criteria for full scale UF system design including: instantaneous flux, recovery, chemical cleaning, filtered water quality (turbidity) and membrane integrity.
- Stable performance of the membrane modules.
- Confirm backwash parameters.
- Confirm required chemical cleaning protocol for the application.
- Maintain greater than 3-log removal through daily MIT.
- Show a finished turbidity water quality of less than 0.1 NTU, 95% of the time.
- Confirm performance of the UF membrane system for TCEQ acceptance.

Throughout the piloting, H2O Innovation's IntelogX™ provided data logging and trending capability for major process parameters.

# Section 2 – Terminology

**Acceptable performance:** A module is generally considered to have acceptable performance when it meets industry standards including CIP intervals of greater than 30 days, fouling rates of less than 0.25 psi/day, filtrate turbidity of less 0.1 NTU, maintaining steady TMP, maintaining membrane integrity by achieving LRV targets, achieving recovery objectives, achieving permeability restoration after CIP, etc.

**Backwash:** The periodic reversal of filtrate flow without cleaning chemical forced from the inside to the outside of the membrane lumen (center of hollow fiber), typically followed by air scour to remove foulants accumulated at the membrane surface. The filtrate water used is backpulsed from the backwash tank into the membrane. At the end of the backwash, the module is drained to rid it of any accumulated solids.

**Coagulant:** Coagulant is a pretreatment chemical that can be injected upstream of the membrane system, usually aluminum or iron-based, to facilitate TOC and/or color removal. Coagulant was not used in the Georgetown Southside WTP pilot program.

**Coagulation:** Coagulation is a form of pretreatment that injects chemical (e.g. Alum) into the feed water to remove dirt and other dissolved organic particles.

**Dead End Filtration:** The term used to describe the hydraulic configuration of the membrane system under deposition mode or direct filtration. During the production cycle no water is wasted; rather it is treated in a batch mode. The term Dead End Filtration is synonymous with Deposition Mode whereby contaminants removed from the feed water accumulate at the membrane surface (and are removed via backwashing). In this method of filtration, no cross flow or bleed flow exists.

**Feedwater:** The influent stream to a water treatment process.

**Filtrate:** The portion of the feedwater that is passed through the membrane from the feed side to the filtered water side.

**Flux:** Volumetric flowrate of the water passing through a membrane expressed in volume per unit membrane per unit time (e.g., gallons per square foot per day (GFD) or liters per hour per square meter (Lmh)).

**Instantaneous Filtrate Flux:** The flux captured at a specific moment in time not taking into account any down time the system exhibits. For this reason, it is a higher value than the net flux.

**Net Filtrate Flux:** A value calculated from the net flow over a period of time, accounting for losses in production during offline events such as backwashing, maintenance cleans, or membrane integrity tests.

**Backwash flux:** The backwash flux is calculated during each production cycle to be 1.1 x the maximum instantaneous filtrate flux.

**Foulant:** Any substance that causes fouling.

**Fouling:** The accumulation of contaminants on a membrane surface that inhibits the passage of water thereby decreasing productivity.

**Hollow fiber module:** Hollow-fiber membranes bundled together longitudinally and either encased in a pressure vessel or submerged in a basin (in the case of immersed membranes).

**Log removal value:** Filtration removal efficiency expressed as log10 (i.e., log10(feed concentration ) – log10(filtrate concentration)).

**Lumen:** The center of a hollow-fiber membrane.

**Maintenance clean:** The injection of a non-heated single chemical solution (at a lower concentration compared to a recovery clean) to the membrane for the intended purpose of maintaining the membrane permeability.

**Membrane integrity test:** A physical test applied to a membrane unit in order to identify and/or isolate integrity breaches.

**Module:** The portion of a complete membrane unit in which the hollow-fiber membrane strands are housed together to a specific membrane surface area.

**Permeability:** The ability of a membrane barrier to allow the passage of a substance through it. The permeability is calculated by comparing the flux to the transmembrane pressure (TMP). Its unit of measure is therefore GFD/PSI. This is measured before and after a backwash over time.

**Temperature Corrected Permeability:** The transmembrane pressure can be temperature adjusted such that the rate of fouling is independent of the temperature of the water. Since the TMP is used to calculate permeability, the same concept applies to the permeability.

**Backwash permeability:** The permeability of the membrane during a backwash sequence.

**Pore size:** The size of the openings in a membrane expressed either as average or maximum, most commonly measured in terms of microns.

**Recovery:** The percent of feed water that is converted to filtrate (calculated through volume) in the treatment process over the course of a production cycle (not including losses that occur due to the use of filtrate in backwashing or maintenance cleaning operations).

**Recovery clean:** The periodic application of a heated or non-heated chemical solution to a membrane unit for the intended purpose of recovering permeability by removing accumulated foulants. Occurs in higher concentrations, often heated, and occur less frequently to maintenance cleans. The intention of the recovery clean is to recover permeability lost over a duration of time, while maintenance cleans are used to maintain permeability over shorter periods of time.

**Total Organic Carbon (TOC):** A measure of the amount of organic materials suspended or dissolved in water.

**Transmembrane Pressure (TMP):** The difference in pressure from the feed to the filtrate across a membrane barrier. This pilot operates at a set flux (which is adjustable through the HMI, but does not adjust itself based on other operating parameters in the system). As the membrane operates over time, the TMP will increase as the membrane becomes fouled.

**Temperature Corrected TMP:** Where variations in temperature are seen in the influent water, the TMP can be adjusted so that the rate of fouling is independent of the temperature of the water at the time.

**Turbidity:** Turbidity is a measure of the light scattered by particles in the water, or in simpler terms, a measurement of the clarity of the water. The typical units of turbidity are nephelometric turbidity units (NTUs).

**Ultrafiltration (UF):** A pressure-driven membrane filtration process that typically employs hollow-fiber membranes with a pore size range of approximately 0.01 – 0.05 µm (averaged at 0.01 µm). In comparison, a microfilter (MF) may have a nominal pore size of 0.1 µm.

# Section 3 – Pilot Equipment Description

## 3.1 UF FiberFlex™ Pilot System

H2O's Fiberflex™ UF pilot system, capable of piloting three hollow fiber UF modules simultaneously, was supplied for the Georgetown Southside WTP pilot. In addition to the feed pump which was supplied separately, the piloting equipment included the following main features:

- Automatic strainer
- Feed tank
- Membrane feed pump
- Backpulse pump and tank
- Membrane cleaning chemical transfer pumps and associated equipment
- Three Ultrafiltration module positions - each position can accommodate multiple module brands and or models.
- PLC/HMI system along with the following automated data logging through IntelogX™:
    - Feed and permeate flow rate
    - Backpulse flow rate
    - Separate feed and permeate pressure for the calculation of the transmembrane pressure of each proposed membrane module
    - Feed temperature
    - Feed turbidity
    - Separate permeate turbidity readings for each proposed module
    - Membrane Integrity along with starting and end pressures, calculated using pressure decay rate through the pressure transmitter for each proposed module
- Compressor system

The main piloting skid is illustrated below.

The Process & Instrumentation Diagrams (P&IDs) for the pilot equipment is provided in Appendix A. Flow meter calibration certificates are provided in Appendix H.

Both the treated water and wastewater generated by the pilot skid were sent to drain during the pilot study.

A turbidity meter was supplied to measure online feed turbidity to the pilot unit. In addition, separate turbidity meters were supplied to measure online permeate turbidity for each module.

The cleaning regime applied on the three modules throughout the pilot is outlined as follows:

- Hypo maintenance cleans - 100 ppm.
- Hypo recovery cleans - 1,000 ppm.
- Citric Acid recovery cleans – 2,000 ppm.
- Recovery cleans heated to 90 deg F.

Quantities of chemicals required for each type of clean are outlined in the below table assuming a 60 gallon make up volume for each chemical solution.

| Type of Clean | Volume of Chemical (mL) | Chemical Supply Strength |
|---|---|---|
| Hypo maintenance clean – 100 ppm | 151 | 12.5% |
| Hypo recovery clean – 1,000 ppm | 1514 | 12.5% |
| Citric recovery clean – 2,000 ppm | 733 | 50% |

## 3.2 Membrane Module Characteristics

The following tables summarize each membrane module characteristics and chemical resistance.

| Description | Unit | UF Membrane Module | | |
|---|---|---|---|---|
| | | Toray HFUG-2020AN | Scinor SMT600-P80 | DuPont SFD-2880XP |
| Membrane Material | - | PVDF | PVDF | PVDF |
| Flow Configuration | - | Outside-in | Outside-in | Outside-in |
| Nominal Pore Size | µm | 0.01 | 0.1 | 0.03 |
| Nominal Surface Area | $ft^2$ | 969 | 861 | 829 |
| Max TMP | psi | 29 | 45 | 30.5 |

| | | | | |
|---|---|---|---|---|
| Module Outside Diameter | inches | 8.5 | 7.9 | 8.9 |
| Operating Temperature Range | °F | 32 to 104 | 33 to 104 | 34 to 104 |

Appendix B provides technical data sheets for the three modules that were used in the pilot program. Note that the operating parameters on data sheets indicated for flux are considered general sizing guidelines considering a wide range of applications, feed quality and operating conditions. Higher fluxes are acceptable to membrane manufacturers where performance can be confirmed through pilot testing on the actual feed source.

# Section 4 – Membrane Operation Summary

As outlined in Section 1, the official minimum 30-day run was performed between August 17 to September 21, 2021.

A chronology of events that occurred throughout the pilot study is provided in Appendix G for reference purposes. This chronology documents the occurrence of chemical cleaning events, any operational changes that occurred on the pilot, as well as incidents of mechanical issues/repairs and downtime.

Upon startup and commissioning of the pilot, a leak was discovered on the DuPont module suggesting a possible broken fiber. On July 14, 2021, H2O Innovation returned to site and repaired (pinned) one broken fiber on the DuPont module. The repair was successful as confirmed by subsequently MIT.

During the optimization phase of the pilot (phase 1), the third module position on the pilot (UF3 - DuPont) experienced problems related to erratic pressure transmitter readings from July 15 to August 16, 2021. Throughout this period, modules UF1 and UF2 continued to run unaffected since each module has its own designated feed pressure transmitter. Multiple trips by H2O Innovation were made to the site to replace components. The troubleshooting process included: replacement of UF3 feed pressure transmitter, replacement of an analogue input card, replacement of the 24-volt power supply as well as replacement of wiring on the UF3 feed pressure transmitter. On August 16, 2021, it was confirmed the issue was related to faulty instrument wiring for the UF3's feed pressure transmitter. From August 16th onwards, no further instrumentation issues were experienced.

On August 6, 2021 the strainer screen was removed from the pilot's Amiad strainer at the request of CDM Smith. The existing production plant already uses a SP Kinney automatic strainer with 200-micron screen and therefore the feed water being sent to the pilot was already being pre-screened by the main plant's existing strainer system. The screen on the pilot unit was removed so that the feed conditions between the existing production plant and the pilot unit were identical.

Throughout the minimum 30-day run of the pilot (phase 2), there were two recorded abnormal outage incidences noted as below. Once the outage issue was corrected and the alarm reset, the pilot resumed normal operation.

- September 6, 2021. A power outage occurred which caused the full-scale production plant and pilot unit to shut down. Pilot unit was off from approximately 7:20pm September 6th until 9:30am September 7th.
- September 13, 2021. A fuse was blown on the pilot's air compressor system. Pilot unit was off from approximately 7:09am to 11:23am on September 13th.

Throughout the pilot program, the full-scale production plant would occasionally shut down when its treated water storage reservoir became full. When the full-scale plant shut down (typically for periods of 2 to 4 hours at a time) the pilot unit also stopped production and went into standby mode. When the full-scale plant resumed operation to meet demand, the pilot automatically resumed production. As a result, the pilot was in standby mode approximately 10% of the time during the study.

## 4.1 Flux Rate, Recovery and Backwash Setpoints

During the optimization phase of the pilot, various instantaneous fluxes were tested between 50 and 80 GFD. As of August 4, 2021 all three modules were set to an instantaneous flux rate of 80 GFD and this flux was held constant for the remainder of the pilot program including the minimum 30-day run (phase 2).

Based on the surface area of each module, the corresponding feed water flow rates for each module at 80 GFD were as follows:

| Module | Flow Rate, GPM |
|---|---|
| Toray | 53.8 |
| Scinor | 46.1 |
| DuPont | 47.8 |

During the minimum 30-day run (phase 2), the backpulse setpoints and timers were set for each module as summarized below. The backpulse flowrate was set using a 1.1X multiplier applied to the production flux. This multiplier is necessary to ensure a higher hydraulic flow during backwash compared to filtration mode, forcing accumulated solids on the surface of the fibers to be removed.

- Toray = 59.2 gpm for 30 seconds
- Scinor = 50.7 gpm for 30 seconds
- DuPont = 52.6 gpm for 30 seconds

In addition, a fixed aeration rate of 5 scfm per module was used with a 30 second duration for the air scour step of each backwash event.

The target recovery of the proposed full-scale UF system was identified by CDM Smith as 96.5%. Based on preliminary design of the full-scale UF system including a capacity per train of 1.2 MGD, the number of modules required per train, and estimated waste volumes for backwash events, this resulted in the following production cycle (time between backwashes) for each module.

| Module | Production Cycle, Minutes* |
|---|---|
| Toray | 30.5 |
| Scinor | 31.8 |
| DuPont | 36.2 |

*Based on an instantaneous flux rate of 80 gfd.

## 4.2 Pretreatment Conditions

No chemical pretreatment (i.e., coagulant, chloramination, pH adjustment, etc.) was utilized through the pilot program.

## 4.3 Chemical Cleaning

### 4.3.1 Maintenance Cleaning

On July 27, 2021 (mid-way through the Phase 1 optimization period), a single sodium hypochlorite maintenance clean was trialed to demonstrate the maintenance clean sequence on each module at a concentration of 100 mg/L. No noticeable impact was observed on membrane permeability following the maintenance clean and this is attributed to the fact that very little fouling was present on the membrane modules.

The maintenance clean sequence on July 27th involved circulating an unheated 100 mg/L sodium hypochlorite solution through each UF module separately. The recirculation was performed at a flux of 25 GFD and alternated between the feed side and the filtrate side of the membranes with a brief soak period between the recirculation steps. The overall duration of each maintenance clean was approximately 20 minutes. No additional maintenance cleans were performed throughout the pilot program.

### 4.3.2 Recovery Cleaning (CIP)

Throughout the pilot program, the only CIP events performed on the modules were at the end of the minimum 30-day run (phase 2). The CIPs were conducted between September 21 and 22, 2021.

H2O Innovation was present at site on the days CIPs were performed and the cleans were implemented in pairs on each of the three modules; using 2,000 mg/L of citric acid, followed by 1,000 mg/L of sodium hypochlorite. CIP cleaning solutions were prepared using heat to a target temperature of 90 degF (32 degC). A recirculation flux of 25 GFD was used during the cleaning procedures.

Temperature corrected permeability of each module is outlined below for the before and after CIP events, along with the percent permeability restored compared to baseline conditions.

| Membrane Module | TC Permeability Baseline, GFD/PSI | TC Permeability Prior to CIP, GFD/PSI | TC Permeability Post CIP, GFD/PSI | % Permeability Restored vs. Baseline |
|---|---|---|---|---|
| Toray | 9.7 | 7.5 | 8.7 | 90% |
| Scinor | 8.1 | 5.2 | 7.4 | 91% |
| DuPont | 6 | 5.0 | 6.0 | 100% |

Permeabilities are temperature corrected (TC) to 20 degC. TC permeability baseline at stable operation taken on July 27 prior to MC events.

Each CIP consisted of three iterations of the following steps:

- 15 minute recirculation on feed side
- 15 minute recirculation on filtrate side
- 10 minute soak

The CIP performance was acceptable in restoring membrane permeabilities on the modules.

It is possible that permeability restoration could have been improved by lengthening the durations of the recirculation steps along with targeting a higher temperature of 104 degF (40 degC) for the cleaning solution. On the proposed full-scale membrane facility, these parameters are easily adjustable by the operator at the control system's HMI.

## 4.4 Other Operating Conditions

Throughout the pilot program, raw water temperature and raw water turbidity was monitored using online instrumentation. Refer to Appendix F for feed water temperature and raw water turbidity data. Section 5.4 discussed feed quality in further detail.

In addition, the permeate turbidity was monitored separately for each module. Permeate turbidity results are contained in Appendix C, D and E for Toray, Scinor and DuPont, respectively.

## Section 5 – Performance and Results

Performance graphs have been included for each module in Appendix C (Toray), Appendix D (Scinor), and Appendix E (DuPont) for the three-month pilot program for the following parameters:

- Flux
- TMP
- TMP, temperature corrected to 20 degC
- Permeability
- Permeability, temperature corrected to 20 degC
- Permeate turbidity
- Membrane integrity testing (MIT)

Membrane Integrity Tests were scheduled for each module using the pilot's HMI and were performed on a daily basis. MIT start and end pressures were used to calculate Log Removal Value (LRV) results according to USEPA's Membrane Filtration Guidance Manual.

Throughout the pilot program there were no recorded failed MIT events and all three modules averaged a LRV score of 5.3 which is well above the minimum target LRV score of greater than 3.0.

Appendix F includes feed water quality graphs for the following parameters:

- Feed water temperature
- Feed water turbidity

The following table provides a comparison of select performance parameters for the three modules based on data collected throughout the minimum 30-day run of Phase 2 which occurred between August 17 and September 21, 2021.

| Module | Average Filtrate Turbidity (mNTU) | % of Time Filtrate Turbidity < 0.1 NTU* | Average LRV Score | Average MIT Pressure Decay Rate (PSI/MIN.) | Average TMP (PSI) | Average Recovery (%)** |
|---|---|---|---|---|---|---|
| Toray | 14.8 | 99.1 | 5.3 | 0.0031 | 9.34 | 97.6 |
| Scinor | 14.7 | 99.2 | 5.3 | 0.0063 | 13.28 | 97.8 |
| DuPont | 14.7 | 99.1 | 5.3 | 0.0080 | 14.42 | 97.1 |

*CDM Smith Pilot Test Protocol identified a treated water quality goal of < 0.1 NTU, more than 95% of the time.

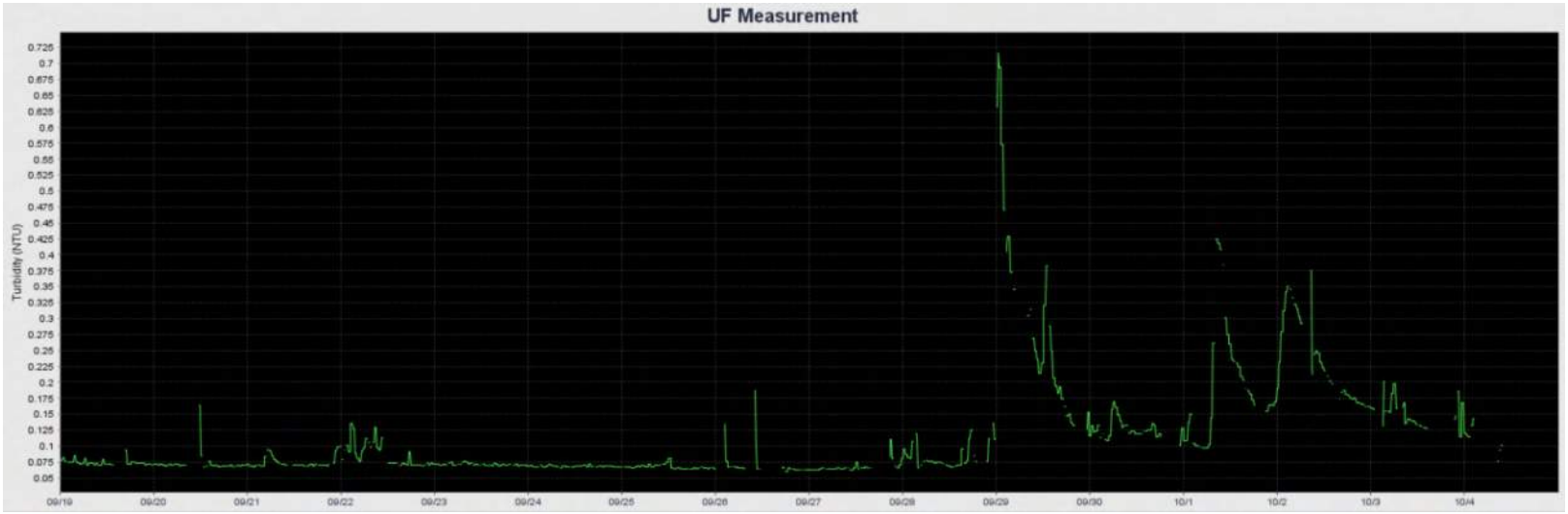
**A target recovery of 96.5% was established for the proposed full scale UF system.

## 5.1 Toray Performance and Results

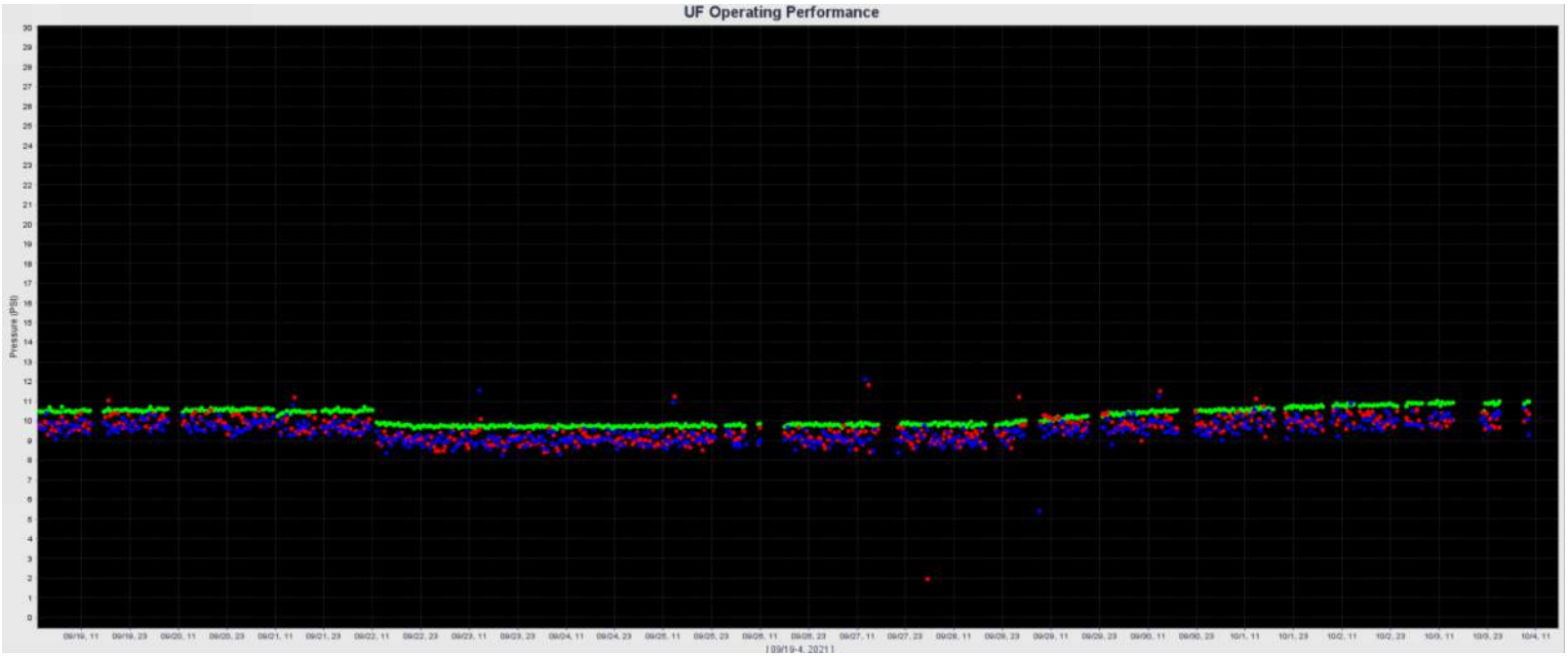
The Toray module achieved acceptable performance throughout the pilot study. The instantaneous flux rate and TMP profile for the Toray module is shown in Appendix C.

During the minimum 30-day run of Phase 2, the Toray module exhibited a gradual fouling profile with relatively small bumps in TMP (i.e., less than 1 psi) during occasional feed turbidity spikes that occurred around August 29th and September 6th. Feedback from CDM Smith indicated that the turbidity spikes were likely due to the cycling of the production wells. Following the feed turbidity spikes, the TMP profiles levelled out and stabilized.

Following the CIP events performed on September 21 and 22, 2021, a gentle rise in TMP profile was observed on module UF1 in the last week of pilot operation due to a rise in raw water turbidity. Snapshots of feed turbidity and UF1's TMP profile from September 19th to October 4th are illustrated below.




Following this elevated feed turbidity event, the Toray module's TMP profile levelled off and was stable, resulting in no loss in performance. (Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)




Throughout the three-month pilot, Toray's TMP did not exceed a value of 11 psi which is approximately 1/3 of the available TMP operating range.

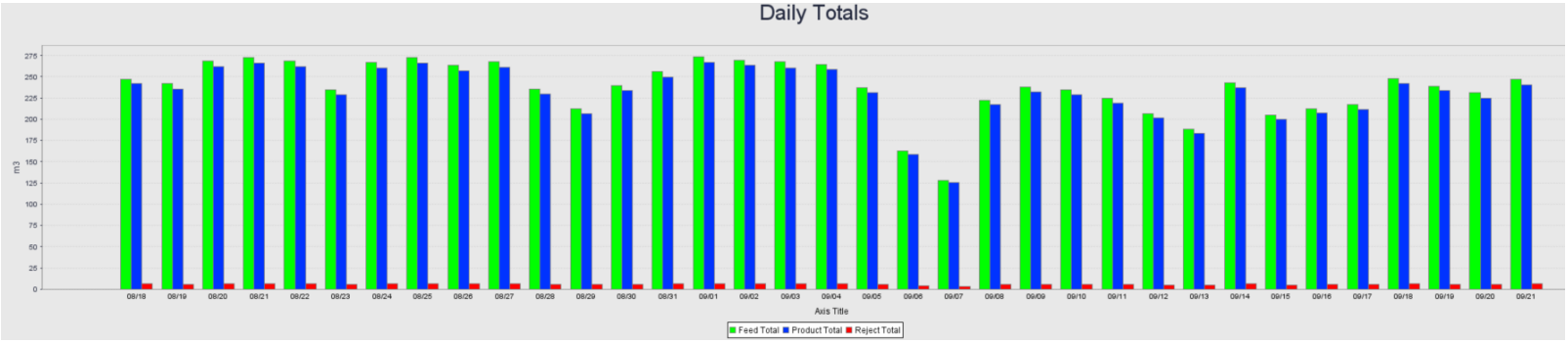
From the CIP event conducted September 21-22, 2021, the Toray module recovered its permeability to approximately 8.7 gfd/psi (temperature corrected to 20 degC). This is considered an acceptable cleaning result.

Permeate turbidity performance for the Toray module was acceptable throughout the pilot with an average filtrate turbidity of 14.8 mNTU, with measured values less than 0.1 NTU approximately 99.1% of the time.

On occasion, filtrate turbidity spikes were observed when the pilot unit came back into production from being offline. Throughout the pilot program, the full-scale production plant would occasionally shut down when its treated water storage tank became full. When the full-scale plant shut down (typically for periods of 2 to 4 hours at a time) the pilot unit also turned off, resulting in periods of non-production on the pilot where dissolved air came out of solution in the filtrate turbidity meter sample line, resulting in false turbidity readings. As a result, some filtrate turbidity spikes were recorded upon restart of the pilot unit with values approaching 0.65 NTU. This hypothesis of false turbidity spike readings is supported by the fact that daily MIT results confirmed intact membranes. It is recommended that bubble traps be installed on the filtrate turbidity instrumentation of the proposed UF membrane plant to help mitigate possible issues with air.

Membrane integrity testing on the Toray module demonstrated consistent performance throughout the pilot study with LRV results of 5.3 which is indicative of intact membranes with very low pressure decay rates during daily the MIT events.

The daily recovery of the Toray module averaged 97.6% which was above the 96.5% value which was targeted. The profile of totalized feed, product and reject is illustrated below for the Toray module during Phase 2, August 17 to September 21, 2021.

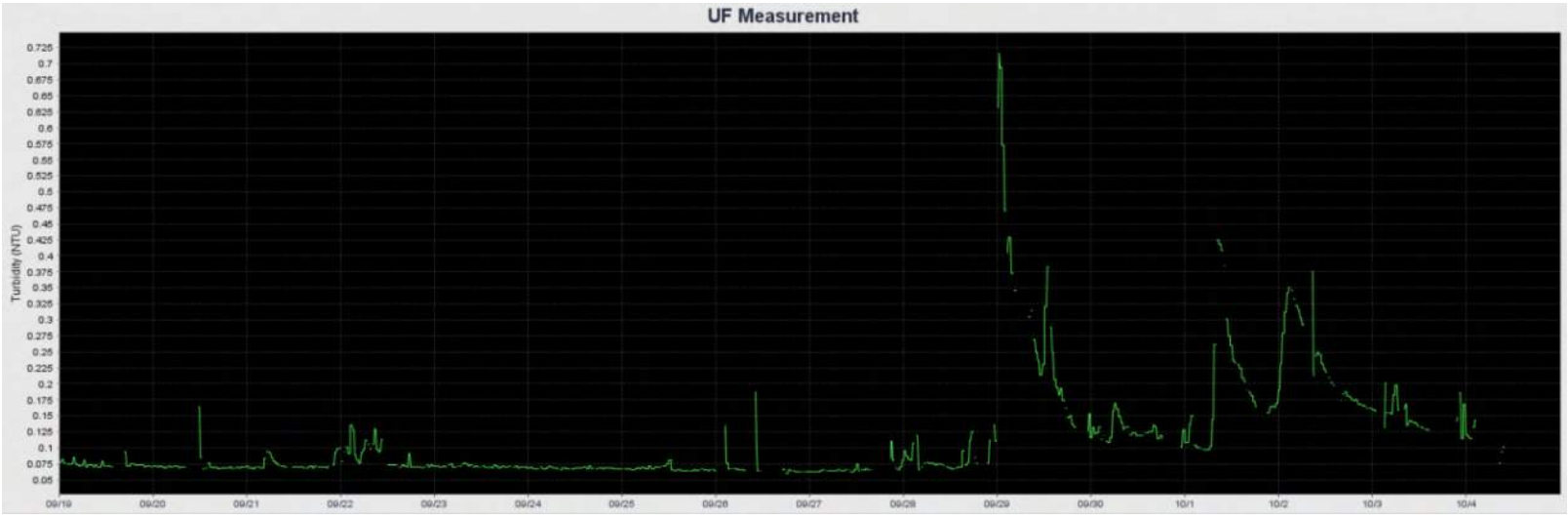



## 5.2 Scinor Performance and Results

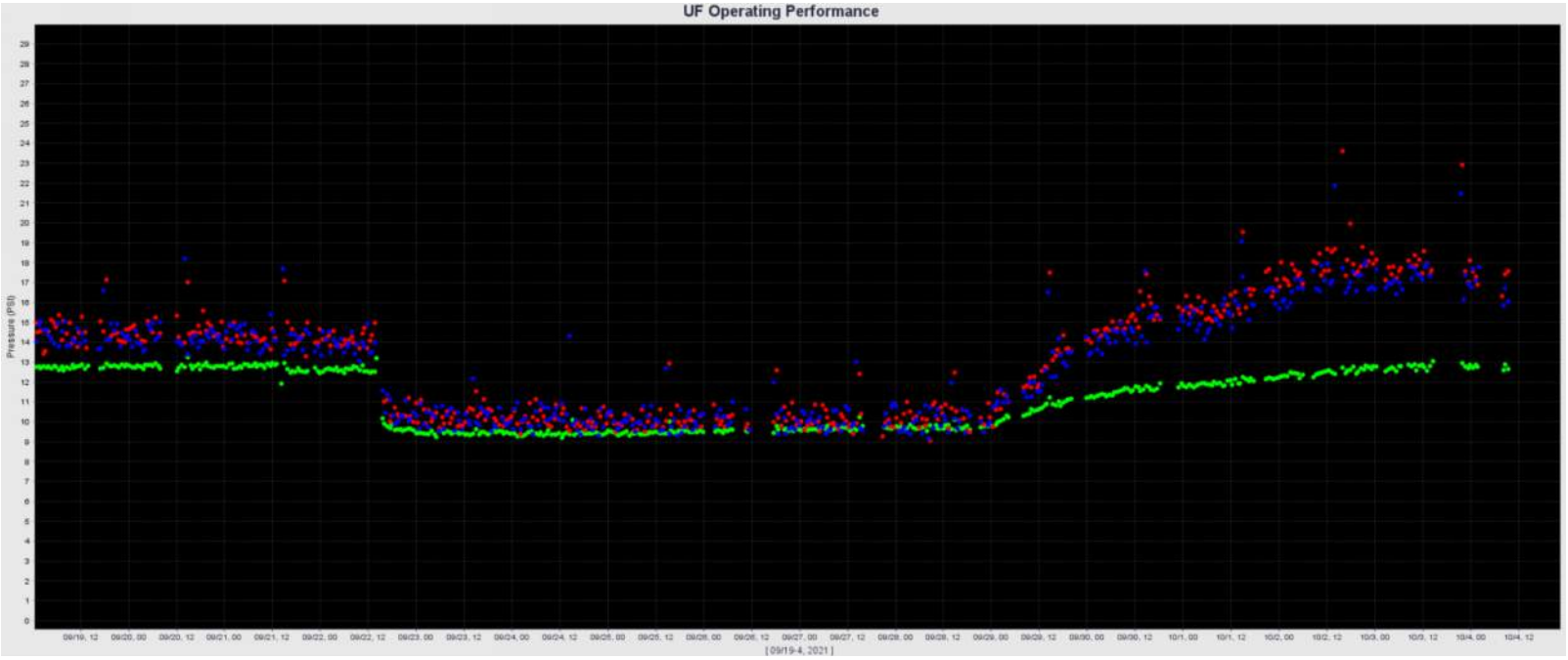
The Scinor module had acceptable performance throughout the pilot study. The instantaneous flux rate and TMP profile for the Scinor module is shown in Appendix D.

During the minimum 30-day run of Phase 2, the Scinor module exhibited a gradual fouling profile with bumps in TMP (i.e., between 3 and 5 psi) during occasional feed turbidity spikes that occurred around August 29th and September 6th. Following the feed turbidity spikes, the TMP profiles levelled out and stabilized.

Following the CIP events performed on September 21 and 22, 2021, a rise in TMP profile was observed on module UF2 in the last week of pilot operation due to a rise in raw water turbidity. Snapshots of feed turbidity and UF2's TMP profile from September 19th to October 4th are illustrated below.




Following this elevated feed turbidity event, the Scinor module's TMP profile was levelling off and becoming stable. (Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)



Throughout the three-month pilot, Scinor's TMP did not exceed a value of 19 psi which is approximately 1/2 of the available TMP operating range.

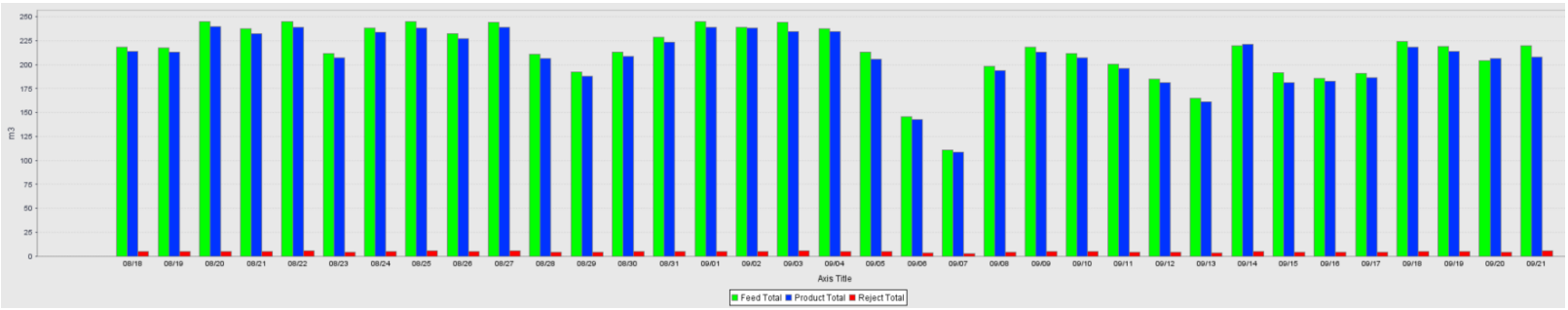
From the CIP event conducted September 21-22, 2021, the Scinor module recovered its permeability to approximately 7.4 gfd/psi (temperature corrected to 20 degC). This is considered an acceptable cleaning result.

Permeate turbidity performance for the Scinor module was acceptable throughout the pilot with an average filtrate turbidity of 14.7 mNTU, with measured values less than 0.1 NTU approximately 99.2% of the time.

The Scinor module experienced similar filtrate turbidity spikes as the Toray module for reasons outlined in Section 5.1 due to dissolved air coming out of solution in the filtrate turbidity meter sample line, resulting in false turbidity readings. Bubble traps on the filtrate turbidity instrumentation of the proposed UF membrane plant will help mitigate issues with air.

Membrane integrity testing on the Scinor module demonstrated consistent performance throughout the pilot study with LRV results of 5.3 which is indicative of intact membranes with very low pressure decay rates during daily the MIT events.

The daily recovery of the Scinor module averaged 97.8% which was above the 96.5% value which was targeted. The profile of totalized feed, product and reject is illustrated below for the Scinor module during Phase 2, August 17 to September 21, 2021.

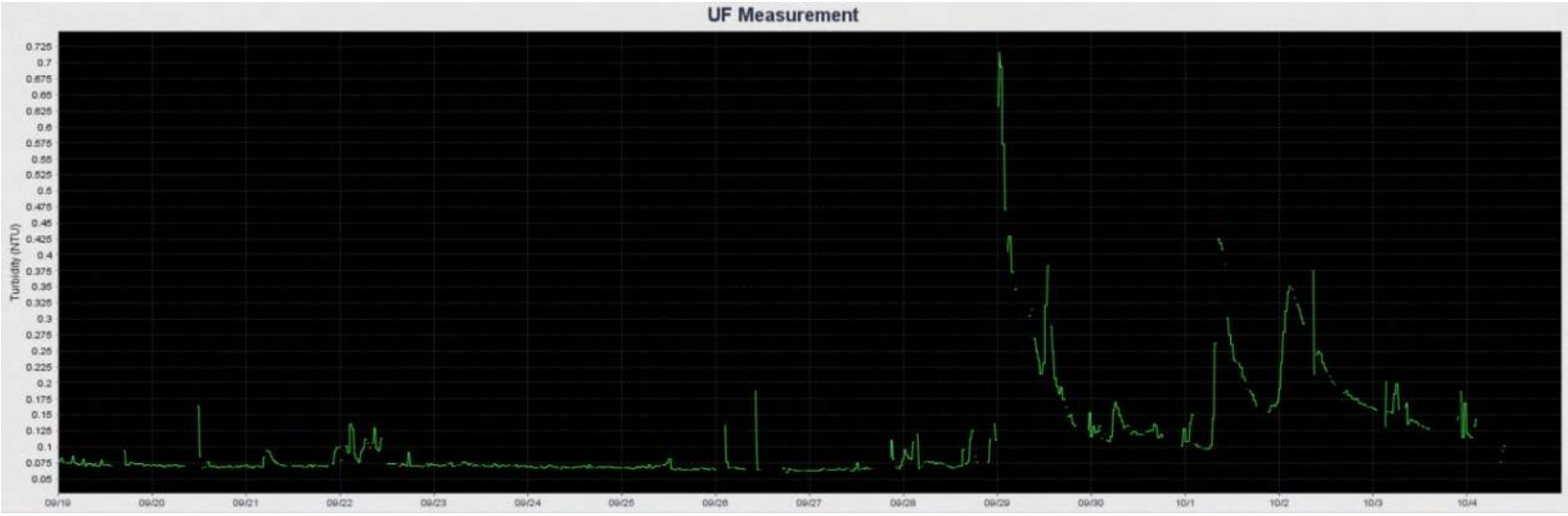



## 5.3 DuPont Performance and Results

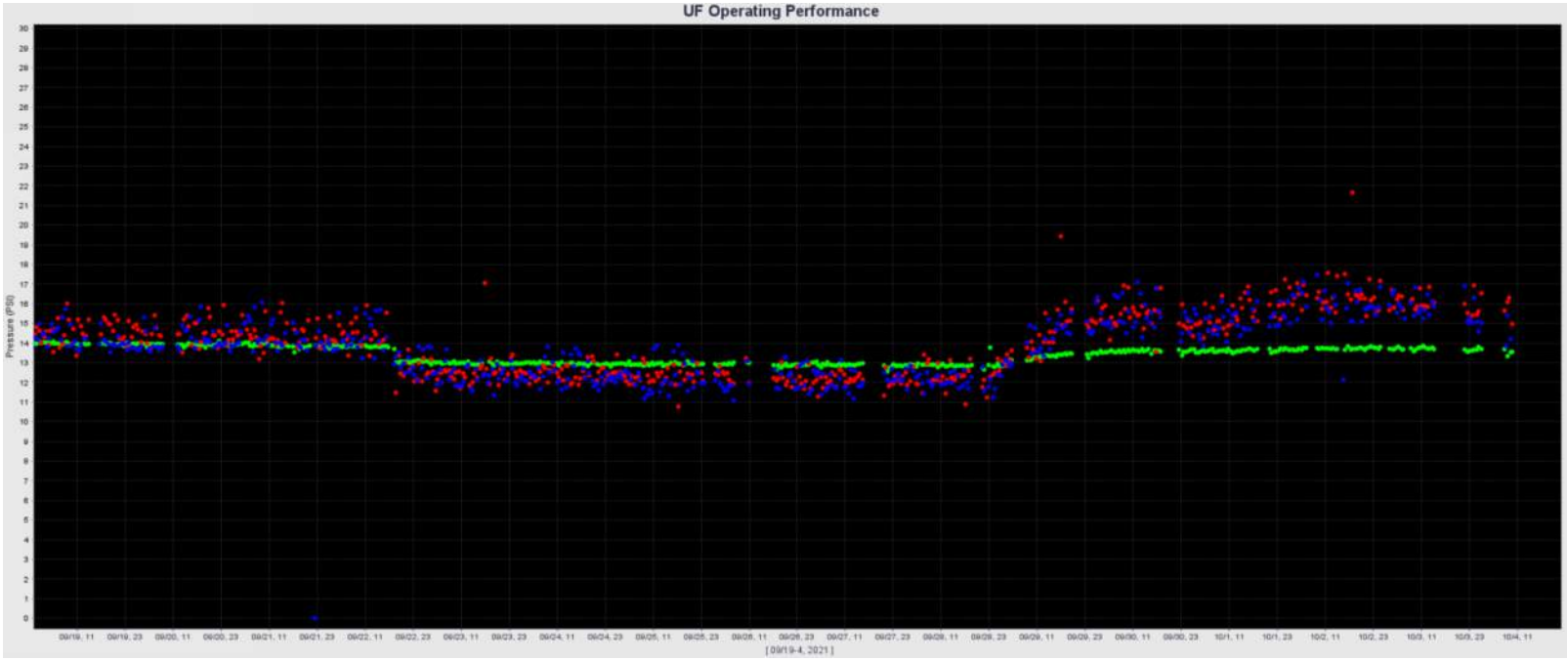
The DuPont module had acceptable performance throughout the pilot study. The instantaneous flux rate and TMP profile for the DuPont module is shown in Appendix E.

During the minimum 30-day run of Phase 2, the DuPont module exhibited a gradual fouling profile with bumps in TMP (i.e., between 3 and 5 psi) during occasional feed turbidity spikes that occurred around August 29th and September 6th. Following the feed turbidity spikes, the TMP profiles levelled out and stabilized.

Following the CIP events performed on September 21 and 22, 2021, a rise in TMP profile was observed on module UF3 in the last week of pilot operation due to a rise in raw water turbidity. Snapshots of feed turbidity and UF3's TMP profile from September 19th to October 4th are illustrated below.




Following this elevated feed turbidity event, the DuPont module's TMP profile levelled off and become stable. (Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)




Throughout the three-month pilot, DuPont's TMP did not exceed a value of 19 psi which is approximately 2/3 of the available TMP operating range.

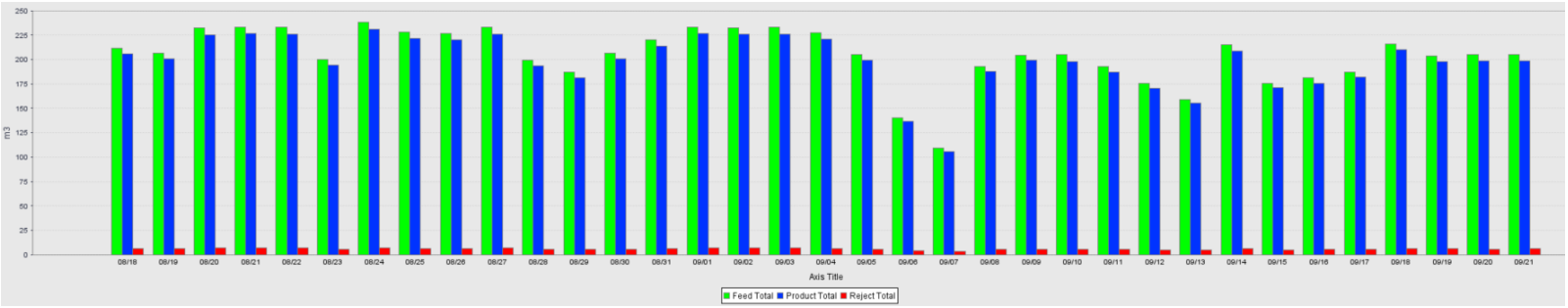
From the CIP event conducted September 21-22, 2021, the DuPont module recovered its permeability to approximately 6.0 gfd/psi (temperature corrected to 20 degC). This is considered an acceptable cleaning result.

Permeate turbidity performance for the DuPont module was acceptable throughout the pilot with an average filtrate turbidity of 14.7 mNTU, with measured values less than 0.1 NTU approximately 99.1% of the time.

The DuPont module experienced similar filtrate turbidity spikes as the Toray and Scinor modules for reasons outlined in Section 5.1 due to dissolved air coming out of solution in the filtrate turbidity meter sample line, resulting in false turbidity readings. Bubble traps on the filtrate turbidity instrumentation of the proposed UF membrane plant will help mitigate issues with air.

Membrane integrity testing on the DuPont module demonstrated consistent performance throughout the pilot study with LRV results of 5.3 which is indicative of intact membranes with very low pressure decay rates during daily the MIT events.

The daily recovery of the DuPont module averaged 97.1% which was above the 96.5% value which was targeted. The profile of totalized feed, product and reject is illustrated below for the DuPont module during Phase 2, August 17 to September 21, 2021.



## 5.4 Feed Water Quality Results

Raw water temperature and raw water turbidity that were recorded using the pilot's online instrumentation is outlined in Appendix F.

During the three-month pilot, raw water temperature varied between approximately 71 degF and 71.2 degF.

Feed water turbidity was typically less than 0.1 NTU coming into the pilot unit. Occasional turbidity spikes occurred up to 0.7 NTU. These spikes appear to coincide with the turning on of the City's production wells to feed the full-scale production plant and the pilot unit.

# Section 6 – Conclusions and Recommendations

Based on the results obtained during the three-month Georgetown Southside WTP pilot study, the following conclusions and recommendations can be made regarding the performance of the membrane modules.

## 6.1 Conclusions and Recommendation

- All three modules produced water that met the turbidity requirements of < 0.1 NTU and LRV requirements of > 3.0. All three modules tested produced filtrate turbidity values < 0.1 NTU over 99% of the time; with LRV results from daily MITs of 5.3.
- The membrane modules successfully demonstrated an instantaneous flux rate of 80 GFD.
- The membrane modules successfully demonstrated a system recovery of greater than 97% which was above the targeted value of 96.5%.
- All three modules exhibited acceptable performance in terms of flow, transmembrane pressure, permeability and membrane integrity.
- The post-CIP permeability of each module (temperature corrected to 20 degC) is summarized as follows: Toray = 8.7 GFD/PSI, Scinor = 7.4 GFD/PSI, DuPont = 6.0 GFD/PSI. CIP procedures produced acceptable results. Permeabilities of the modules were restored to 90% and greater compared to baseline.
- While TMP performance was acceptable on all three modules tested, system operation on the proposed full scale membrane facility would benefit by having capability to perform routine maintenance cleans using 100 mg/L sodium hypochlorite. The maintenance clean event (including the subsequent neutralization process) would be a fully automated event that can be scheduled by the operator at the main control panel's HMI using the calendar scheduling tool. It is important to note that no additional equipment is required to perform maintenance cleans since the CIP system proposed for the full-scale membrane facility already includes the required components such as: CIP tank and heater, CIP recirculation pumps, chemical dosing skids and required valves and instrumentation.
- The recommended cleaning regime for the proposed full scale membrane facility would therefore include the following types of cleans. Note, the actual frequency of cleaning events would be a function of the UF system's production rate and the degree of membrane fouling as a function of feed water quality:
    - 100 mg/L sodium hypochlorite maintenance clean. Suggested frequency of once every 2 to 4 weeks per train.
    - 1,000 mg/L sodium hypochlorite heated recovery clean (i.e., hypo CIP). Suggested frequency of 2 to 4 months per train.
    - 2,000 mg/L citric acid heated recovery clean (i.e., acid CIP). Suggested frequency of 3 to 6 months per train.
- The proposed full scale UF system will have flexibility in terms of maintenance cleaning and CIP sequences to ensure smooth and reliable operation, allowing the membranes to effectively deal with the range of feed water quality conditions.
- It is recommended to incorporate bubble traps on the filtrate turbidity instrumentation on the full-scale membrane system to help mitigate possible issues with entrained air.

If you have any questions concerning the above information, please do not hesitate to contact us.

Sincerely,
H2O Innovation

# PROCESS & INSTRUMENTATION DIAGRAMS FOR FIBERFLEX PILOT UNIT

## VALVE SYMBOLS

N.OPEN N.CLOSED

- BALL
- V-BALL
- BUTTERFLY
- DIAPHRAGM
- GATE
- GLOBE
- NEEDLE
- PLUG
- SAMPLE/DRAIN
- CHECK
- BACKFLOW PREVENTER
- 3-WAY, 4-WAY
- PRESSURE REGULATING
- BACK PRESSURE REGULATING
- FLOW CONTROL
- 2-WAY SOLENOID
- 3-WAY SOLENOID
- 4-WAY SOLENOID
- AIR RELEASE
- VACUUM BREAKER
- PRESSURE RELEASE
- SLUICE GATE/WEIR

## VALVE ACTUATOR SYMBOLS

- PNEUMATIC (FAIL LAST POSITION)
- PNEUMATIC FAIL CLOSE
- PNEUMATIC FAIL OPEN
- ELECTRIC
- DIAPHRAGM
- POSITIONER (ANY ACTUATOR TYPE)
- HAND OVERRIDE (ANY ACTUATOR TYPE)
- TRAVEL STOPS (ANY ACTUATOR TYPE)

## FLOWMETER SYMBOLS

INTEGRAL — CLOSE COUPLED — REMOTE

- MAGNETIC
- PADDLE
- VORTEX
- DP/ORIFICE
- THERMAL
- ROTAMETER

## INSTRUMENTATION SYMBOLS

| LOCALLY MOUNTED | IN CONTROL PANEL | DESCRIPTION |
|---|---|---|
| X nnnnn | X nnnnn | DISCRETE INSTRUMENT |
| | X nnnnn | PRIMARY PLC OR DCS SHARED CONTROL |
| | X nnnnn | SECONDARY PLC OR DCS SHARED CONTROL |
| | X nnnnn | COMPUTER FUNCTION |

## INSTRUMENT FUNCTIONS

- K — SIGNAL PROCESSING FUNCTION
- A/M — AUTO/MANUAL
- Σ — ADDITION/SUMMATION
- Δ — DIFFERENTIAL
- I — INTERLOCK LOGIC FUNCTION
- AVERAGING

## INSTRUMENT CONNECTIONS

- SOCKETWELD
- THREADED
- WELDED

## PIPING SYMBOLS

- FLANGED CONNECTION
- THREADED CONNECTION
- BLIND FLANGE
- DOUBLE CONTAINMENT
- QUICK DISCONNECT VICTAULIC
- x" INSULATION THICKNESS INSULATION
- QUICK DISCONNECT CAMLOK
- x" INSULATION THICKNESS HEAT TRACING E=ELECTRIC S=STEAM G=GLYCOL
- CAPPED PIPE END
- DRAIN OUTLET
- UNION
- REDUCER ECCENTRIC REDUCER
- EXPANSION/FLEXIBLE/ ISOLATION JOINT

## PIPING ABBREVIATIONS

| | |
|---|---|
| 316 SS | 316 STAINLESS STEEL |
| 304 SS | 304 STAINLESS STEEL |
| 316L SS | LOW CARBON 316 STAINLESS STEEL |
| 304L SS | LOW CARBON 304 STAINLESS STEEL |
| CPVC | CHLORINATED POLYVINYL CHLORIDE |
| CS | CARBON STEEL |
| DI | DUCTILE IRON |
| HDPE | HIGH-DENSITY POLYETHYLENE |
| PE | POLYETHYLENE |
| PVC | POLYVINYL CHLORIDE |
| RLCS | RUBBER LINED CARBON STEEL |
| SCH. | SCHEDULE |
| SDR | STANDARD DIMENSION RATIO |

## LINE SYMBOLOGY

- MAIN PROCESS LINE
- SECONDARY PROCESS LINE
- PROCESS LINE, BY OTHERS
- COMM LINK (EX. PLC TO HMI)
- COMM LINK (EX. PLC TO DCS)
- ELECTRIC WIRING
- PNEUMATIC LINE
- LINE JUMPER
- PIPE DISCONTINUATION
- FLOW DIRECTION ARROWS
- 4" 316 SS SCH.10 — LINES SIZE/ MATERIAL IDENTIFIER
- SKID BOUNDARY — NOT BY $H_2O$ Innovation / SKID BY $H_2O$ Innovation
- REVISION
- LINES TO/FROM OTHER SHEETS — DESCRIPTION — C01-0001 SHT 1 — DESTINATION

## PUMP SYMBOLS

- CENTRIFUGAL
- CHEMICAL METERING
- DIAPHRAGM
- POSITIVE DISPLACEMENT
- VACUUM
- SUBMERSIBLE OR FLOATING
- VERTICAL TURBINE
- PERISTALTIC/HOSE

## MISCELLANEOUS EQUIPMENT SYMBOLS

- CARTRIDGE FILTER HOUSING
- AUTOMATIC STRAINER
- SILENCER
- MIXER
- STATIC MIXER
- RESIN TRAP
- MOTOR
- EDUCTOR OR VENTURI
- Y STRAINER
- CONICAL OR TEMPORARY STRAINER
- PULSATION DAMPENER
- DIAPHRAGM
- FLOW ORIFICE
- AIR COMPRESSOR
- RUPTURE DISK (PRESSURE)
- RUPTURE DISK (VACUUM)
- SPECTACLE BLIND (NORMALLY OPEN, NORMALLY CLOSED)
- INJECTION QUILL
- FILTER
- REFRIGERATED AIR DRYER
- TANK
- MMF TANK
- IMMERSED HEATER
- IN-LINE HEATER
- ULTRASONIC LEVEL TRANSMITTER
- FLOAT-STYLE LEVEL TRANSMITTER
- CHEMICAL CONTAINMENT
- CALIBRATION COLUMN
- MEMBRANE
- UV STERILIZER
- DIFFUSERS:
- COARSE BUBBLE
- FINE BUBBLE
- POSITIVE DISPLACEMENT BLOWER
- REGENERATIVE BLOWER
- CENTRIFUGAL BLOWER
- TURBOCHARGER
- BIO-WHEEL
- MANWAY

## FLOW INSTRUMENTS

| | |
|---|---|
| FAH | FLOW ALARM HIGH |
| FAL | FLOW ALARM LOW |
| FCV | FLOW CONTROL VALVE |
| FE | FLOW ELEMENT |
| FI | FLOW INDICATOR |
| FIC | FLOW INDICATING CONTROLLER |
| FIT | FLOW INDICATING TRANSMITTER |
| FR | FLOW RECORDING |
| FSH | FLOW SWITCH HIGH |
| FSL | FLOW SWITCH LOW |
| FV | FLOW CONTROL OR ON/OFF VALVE |
| FQ | FLOW TOTALIZER |
| FY | FLOW SIGNAL CONVERT, I/P, OR SOLN |

## PRESSURE INSTRUMENTS

| | |
|---|---|
| PAH | PRESSURE ALARM HIGH |
| PAL | PRESSURE ALARM LOW |
| PC | PRESSURE CONTROLLER |
| PCV | SELF REG PRESS CONTROL VALVE |
| PDH | DIFFERENTIAL PRESSURE HIGH |
| PDI | DIFFERENTIAL PRESSURE INDICATOR |
| PDIT | DIFF PRESS INDICATING TRANSMITTER |
| PDSH | DIFFERENTIAL PRESS SWITCH HIGH |
| PG | PRESSURE GAUGE |
| PI | PRESSURE INDICATOR |
| PIC | PRESSURE INDICATING CONTROLLER |
| PIT | PRESSURE INDICATING TRANSMITTER |
| PSH | PRESSURE SWITCH HIGH |
| PSL | PRESSURE SWITCH LOW |
| PSV | SELF REG PRESS SAFETY VALVE |
| PT | PRESSURE TRANSMITTER |
| PY | PRESS SIGNAL CONVERT, I/P, OR SOLN |
| PSLH | PRESSURE SWITCH LOW HIGH |

## LEVEL INSTRUMENTS

| | |
|---|---|
| LAH | LEVEL ALARM HIGH |
| LAL | LEVEL ALARM LOW |
| LCV | SELF REG LEVEL CONTROL VALVE |
| LE | LEVEL ELEMENT |
| LG | LEVEL GAUGE |
| LI | LEVEL INDICATOR |
| LIC | LEVEL INDICATING CONTROLLER |
| LIT | LEVEL INDICATING TRANSMITTER |
| LSH | LEVEL SWITCH HIGH |
| LSL | LEVEL SWITCH LOW |
| LT | LEVEL TRANSMITTER |
| LV | LEVEL CONTROL OR ON/OFF VALVE |
| LY | LEVEL SIGNAL CONVERT, I/P, OR SOLN |

## TEMPERATURE INSTRUMENTS

| | |
|---|---|
| TAH | TEMPERATURE ALARM HIGH |
| TAL | TEMPERATURE ALARM LOW |
| TC | TEMPERATURE CONTROLLER |
| TE | TEMPERATURE ELEMENT |
| TG | TEMPERATURE GAUGE |
| TI | TEMPERATURE INDICATOR |
| TIC | TEMP INDICATING CONTROLLER |
| TIT | TEMP INDICATING TRANSMITTER |
| TSH | TEMPERATURE SWITCH HIGH |
| TSL | TEMPERATURE SWITCH LOW |
| TT | TEMPERATURE TRANSMITTER |
| TV | TEMP CONTROL OR ON/OFF VALVE |
| TY | TEMP SIGNAL CONVERT, I/P, OR SOLN |

## ELECTRICAL ABBREVIATIONS

| | |
|---|---|
| JB | JUNCTION BOX |
| MCP | MAIN CONTROL PANEL |
| RIO | REMOTE I/O PANEL |
| PP | POWER PANEL |
| VFD | VARIABLE FREQUENCY DRIVE |
| HOA | HAND-OFF-AUTO |

## ANALYTICAL INSTRUMENTS

| | |
|---|---|
| AAH | ANALYTICAL ALARM HIGH |
| AAL | ANALYTICAL ALARM LOW |
| AE | ANALYTICAL ELEMENT |
| AI | ANALYTICAL INDICATOR |
| AIC | ANAL INDICATING CONTROLLER |
| AIT | ANAL INDICATING TRANSMITTER |
| ASH | ANALYTICAL SWITCH HIGH |
| ASL | ANALYTICAL SWITCH LOW |
| AT | ANALYTICAL TRANSMITTER |
| AY | ANALYTICAL SIGNAL CONVERT, I/P, OR SOL |

## MISCELLANEOUS INSTRUMENTS

| | |
|---|---|
| HS | HAND SWITCH |
| HI | HAND SWITCH POSITION INDICATOR |
| II | CURRENT INDICATOR |
| QQI | TOTALIZER INDICATOR |
| SC | SPEED CONTROLLER |
| SI | SPEED INDICATOR |
| YA | MOTOR ALARM |
| YC | MOTOR CONTROL |
| YI | MOTOR ON/OFF INDICATOR |
| ZIC | SWITCH CLOSE INDICATOR |
| ZIO | SWITCH OPEN INDICATOR |
| ZSC | POSITION SWITCH CLOSED |
| ZSO | POSITION SWITCH OPEN |
| ZT | POSITION TRANSMITTER |
| ZI | POSITION INDICATOR |

## VALVES & EQUIPMENT

| | |
|---|---|
| AC | AIR COMPRESSOR |
| ARV | AIR RELEASE VALVE |
| AS | AIR SUPPLY |
| B | BLOWER |
| BT | BULK TOTE |
| CBD | COARSE BUBBLE DIFFUSER |
| CV | CHECK VALVE |
| ED | EDUCTOR |
| F | FILTER |
| FBD | FINE BUBBLE DIFFUSER |
| FL | FAIL LAST (DEFAULT IF NOT SHOWN) |
| FC | FAIL CLOSED |
| FO | FAIL OPEN |
| FQG | CALIBRATION COLUMN |
| H | HEATER |
| HCV | HAND CONTROL VALVE |
| HTR | HEATER |
| HV | HAND VALVE |
| M | MOTOR |
| MX | MIXER |
| P | PUMP |
| RT | RESIN TRAP |
| ST | SPILL TANK |
| STR | STRAINER |
| T | TANK |
| UV | ULTRAVIOLET |
| HV | HAND VALVE |
| MV | MULTI FUNCTION VALVE |

## OTHER ABBREVIATIONS

| | |
|---|---|
| CAP | CAPACITANCE |
| CIP | CLEAN-IN-PLACE |
| COND | CONDUCTIVITY |
| DO2 | DISSOLVED OXYGEN |
| ESP | EMERGENCY STOP |
| IA | INSTRUMENT AIR |
| I/P | CURRENT TO PNEUMATIC CONVERTER |
| ORP | OXIDATION REDUCTION POTENTIAL |
| pH | HYDROGEN ION |
| RES | RESISTIVITY |
| RTD | RESISTANCE TEMP DETECTOR |
| SOL | SOLENOID |
| SP | SET POINT |
| uS | MICROSIEMENS |



## DRAWING REVISION

| REV | DATE (DD/MM/YYYY) | REVISION DESCRIPTION | DRAWN | CHKD | ENG | APPVD |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 0 | 2015/08/19 | FIRST DESIGN SUBMITTAL | MP | DON | DON | MB |

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UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±1/64"
DECIMALS: X.X: ±0.030
X.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/64"
HOLE CENTERS: ±1/32"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE

ULTRA FILTRATION MEMBRANE PILOT

TITLE: PROCESS AND INSTRUMENTION DIAGRAMS LEGEND

SCALE: N/A

DRAWING NUMBER: C53855-C01-0001

REVISION: 0

SHEET: 1 of 1

Item # 3.

CONTINUED

RAW WATER
(BY OTHERS)

0-100NTU
AIT 10209 / AI 10209 H
120 VAC AI
AE 10209
TURB 1/4"
1/2"
FI 10274
0 TO 10 GPH
0 TO 150 GPM
FI 11232 / FX 11250
AI
FIT 11232
120 VAC
PID
FIC 11250
AO
ZY 11250
I/P
M
FCV-11250
VENT 1/2"
IQ-84397B
IQ-81097B
IQ-80197
1/4" PE TUBING
1/2" PVC SCH.80
SODIUM HYDROXIDE
C01-0370 SHT 1
FROM DOSING PUMP
1/4" PE TUBING
NOTE 5
SULFURIC ACID
C01-0370 SHT 1
FROM DOSING PUMP
1/4" PTFE TUBING
NOTE 5
COAGULANT / OXIDANT
C01-0800 SHT 2
FROM DOSING PUMP
DPSH 11200
M
AUTOMATED STRAINER F-11200
3" PVC SCH.80
FV-11225
NOTE 4
FV-14001
4" PVC SCH.80
1½" PVC SCH.80
FEED / COAGULATION TANK T-14000
0 TO 100 IN H2O
1/2"
LT 14060 / LIT 14060
HH H L LL
24 VDC AI
0 TO 100 °C
1/2"
TT 14078 / TI 14078
AI
M
FEED PUMP P-10200
2"
4"
HV-14078
HV-14029 1/4"
4" PVC SCH.80
HV-10250
2-1/2"
3"
CV-10251
1" PVC SCH.80
HV-14083
1/2"
3"
1½" PVC SCH.80
HV-10230
-1000 to 1000 SCU
AIC 10209 / AI
H L
ATT 10210 / AIC 10210
0-14 pH
120 VAC AI
AE 10210 SC
AE 10290 pH
0 TO 50 PSI
PX 10200 / PI 10259
HH H L LL
AI
PT 10259
24 VDC
1/2"
HV-10252
3" PVC SCH.80
PRE FILTRED WATER
C01-0310 SHT 1
TO UF MODULES
HV-10229 1/4"
WASTE
C01-0310 SHT 1
TO DRAIN
NOTE 1
4" PVC SCH.80

Note: No pretreatment chemicals were used during Georgetown Southside WTP pilot study.

SIGNAL
FROM PROCESS VARIABLE
PID SPD START FLT RUN HOA
PIC SI YC YA YI HS
SC
M 480 VAC, 60Hz, 3PH
TYPICAL PUMP MOTOR WITH VFD

HOA O/C
HS YC
FY
24 VDC
IA
S
EXH
TYPICAL AUTOMATED VALVE

START BW FLT
YC YI YA
DO DI DI
M 120 VAC, 60Hz, 1PH
TYPICAL STRAINER

SKID BY $H_2O$ Innovation
NOT BY $H_2O$ Innovation

CONTINUED

NOTES:
1. VACUUM BREAKER SUGGESTED ON DRAIN LINE AFTER SKID.
2. MINIMUM FEED PRESSURE IS 22 PSIG FOR STRAINER BACK WASHING.
3. MAX. HEIGHT OF EACH SKID SECTION IS 88" TO FIT IN STANDARD ISO CONTAINER.
4. FOR FUTURE OXIDATION TANK CONNECTION.
5. ACID AND BASE LINES TO BE ROUTED APART FROM EACH OTHER ON SKID. COAGULANT LINE CAN BE ROUTED WITH ACID.



DRAWING REVISION

| REV | DATE (DD/MM/YY) | REVISION DESCRIPTION | DRAWN | CHKD | ENG | APPVD |
|---|---|---|---|---|---|---|
| 4 | 2015/10/08 | FIFTH DESIGN SUBMITTAL | MP | DON | DON | MB |
| 3 | 2015/10/03 | FOURTH DESIGN SUBMITTAL | MP | DON | DON | MB |
| 2 | 2015/09/04 | THIRD DESIGN SUBMITTAL | MP | DON | DON | MB |
| 1 | 2015/08/27 | SECOND DESIGN SUBMITTAL | MP | DON | DON | MB |
| 0 | 2015/08/19 | FIRST DESIGN SUBMITTAL | MP | DON | DON | MB |

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UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±X"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±X"
HOLE CENTERS: ±X"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE

ULTRA FILTRATION MEMBRANE PILOT

TITLE:
RAW WATER
PROCESS & INSTRUMENTATION DIAGRAM

SCALE: N/A

DRAWING NUMBER: C53855-C01-0110

SHEET: 1 of 1

674

CONTINUES

CONTINUED

BACKWASH WATER
C01-0390 SHT 1
FROM BACKWASH PUMPS

2" PVC SCH.80

3" PVC SCH.80

FILTRATE
C01-0390 SHT 1
TO FILTRATE TANK

Note: individual laser turbidity meters were installed on each of the three piloted modules.

NOTE 1
0 TO 1 NTU
AI 31009-1
AIT 31009-1
AE 31009-1
120 VAC
TURB
1/4"
0 TO 10 GPH
FI 31074
SP = 8 GPH
1/2"
3/8"
3/8" PE TUBING

1/2" SCH.80 PVC

FV-31201-1 / FV-31099-1 / SV-31027-1 3/8" / 0-50 PSI PI 31059-1 AI / PT 31059-1 24 VDC
FV-31201-2 / FV-31099-2 / SV-31027-2 3/8" / 0-50 PSI PI 31059-2 AI / PT 31059-2 24 VDC
FV-31201-3 / FV-31099-3 / SV-31027-3 3/8" / 0-50 PSI PI 31059-3 AI / PT 31059-3 24 VDC
3" SCH.80 PVC
1/2" SV-31077-1 3/8" 1/2"
1/2" SV-31077-2 3/8" 1/2"
1/2" SV-31077-3 3/8" 1/2"

FV-31499-1 1 1/2" HDPE FV-31299-1 2" VB-31026-1 1" 1 1/2" FV-31452-1
FV-31499-2 1 1/2" HDPE FV-31299-2 2" VB-31026-2 1" 1 1/2" FV-31452-2
FV-31499-3 1 1/2" HDPE FV-31299-3 2" VB-31026-3 1" 1 1/2" FV-31452-3

MODULE 1
MODULE 2
MODULE 3

1 1/2" PVC SCH.80
CIP RECIRCULATION
C01-0370 SHT 1
TO CIP TANK

0-60 PSI PI 31045-1 AI / PT 31045-1 24 VDC
0-60 PSI PI 31045-2 AI / PT 31045-2 24 VDC
0-60 PSI PI 31045-3 AI / PT 31045-3 24 VDC

2" 316L SS SCH 10
CV-31851-1
CV-31851-2
CV-31851-3

FV-31025-1
FV-31025-2
FV-31025-3

2" PVC SCH.80

FX 37000
0-100 GPM
FX 31001-1 / FI 31032-1 AI / 31032-1 M
FX 31001-2 / FI 31032-2 AI / 31032-2 M
FX 31001-3 / FI 31032-3 AI / 31032-3 M
PID FIC 31001-1 AO / ZY 31001-1 I/P / FCV-31001-1 1/2" 3"
PID FIC 31001-2 AO / ZY 31001-2 I/P / FCV-31001-2 1/2" 3"
PID FIC 31001-3 AO / ZY 31001-3 I/P / FCV-31001-3 1/2" 3"

1/2" PE TUBING

2" 4"

4" PVC SCH.80

BACKWASH WASTE
TO DRAIN

CONTINUED

PRE FILTERED WATER
C01-0110 SHT 1
FROM FEED PUMP
3" PVC SCH.80

CIP SOLUTION
C01-0370 SHT 1
FROM CIP PUMP
1 1/2" PVC SCH.80

FV-31401-1
FV-31401-2
FV-31401-3

MIT AIR
C01-0950 SHT 1
FROM AIR COMPRESSOR
3/8" SS SCH.10
SV-31801-1 / SV-31801-2 / SV-31801-3
3/8" PE TUBING 1/2" 3/8"

SV-31601-1
SV-31601-2
SV-31601-3

AIR SCOUR
C01-0950 SHT 1
FROM AIR COMPRESSOR
0-8 CFM
FI 31674-1 / FI 31674-2 / FI 31674-3

C01-0110 SHT 1
TO DRAIN
1/2" SS TUBING
4" PVC SCH 80

HS DO S 24 VDC
TYPICAL SOLENOID VALVE

HOA O/C HS YC FY 24 VDC IA S EXH
TYPICAL AUTOMATED VALVE

CONTINUES
SKID BY $H_2O$ Innovation
NOT BY $H_2O$ Innovation

NOTES:

1. THREE ANALOGUE INPUTS REQUIRED IN CASE EXTRA TURBIDITY METERS ARE NEEDED. ALLOW SPACE FOR THREE UNITS.



DRAWING REVISION

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|---|---|---|---|---|---|---|
| 4 | 2015/10/08 | FIFTH DESIGN SUBMITTAL | MP | DON | DON | MB |
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| 0 | 2015/08/19 | FIRST DESIGN SUBMITTAL | MP | DON | DON | MB |

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UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±X/₆₄"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±X/₆₄"
HOLE CENTERS: ±X/₆₄"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE

ULTRA FILTRATION MEMBRANE PILOT

TITLE:
ULTRA FILTRATION UNIT
PROCESS & INSTRUMENTATION DIAGRAM

SCALE: N/A

DRAWING NUMBER: C53855-C01-0310

SHEET: 1 of 1

675

Note: No sulfuric acid was used during Georgetown Southside WTP pilot study.

CONTINUES

CONTINUED

SODIUM HYPOCHLORITE
C01-0800 SH 1
FROM DOSING PUMP

1/4" PE TUBING (1)

CITRIC ACID
C01-0800 SH 1
FROM DOSING PUMP

1/4" PE TUBING (1)

SODIUM BISULFITE
C01-0800 SH 3
FROM DOSING PUMP

1/4" PE TUBING (1)

SODIUM HYDROXIDE
C01-0800 SH 3
FROM DOSING PUMP

1/4" PTFE TUBING (1)

1/4" 1/2" FV-84352 1/2" 1/4"

1/4" PTFE TUBING

SODIUM HYDROXIDE
C01-0110 SH 1
TO FEED SYSTEM

SULFURIC ACID
C01-0800 SH 2
FROM DOSING PUMP

1/4" PTFE TUBING

1/4" 1/2" FV-81052 1/2" 1/4"

1/4" PTFE TUBING

SULFURIC ACID
C01-0110 SH 1
TO FEED SYSTEM

CIP RECIRCULATION
C01-0310 SHT 1
FROM UF TRAINS

1 1/2" PVC SCH 80 (1)

1/4" PTFE TUBING

1/4" PTFE TUBING

FILTRATE
C01-0390 SHT 1
FROM BW PUMPS

HV-37201B (2)

HAND AUTO START FAULT HOA
TIC 37284 | HIH HIA 37284 DI | YC 37284 DO | YA 37284 DI | HS 37284 | TC 37284

HV-37201A (2) FV-37201 (1)

1" PVC SCH 80

1" PVC SCH 80

LIC 37260 HH H L AI LL

LT 37260 0 TO 50 IN H2O 24 VDC

CIP TANK T-37200

HE-37284 480 VAC, 60Hz, 3PH

0 TO 100°C TT 37278 HH | TI 37278 TA 37284 AI (3)

2" PVC SCH 80

CONTINUES

CIP TANK FILL

2" 1 1/2" FV-37278 1 1/2" PVC SCH 80 1 1/2" 1 1/4" M CIP PUMP P-37000 1 1/4" 2" CV-37051 2" 1-1/2"

2" 3" 3" PVC SCH 80 (1)

IQ-81097A IQ-84397A IQ-84197 IQ-83797 IQ-83597

NOTE 1

1" 1/2" FV-37083 1 1/2" FV-37052 1 1/2" PVC SCH 80 (1)

UF CIP SUPPLY
C01-0310 SHT 1
TO UF TRAINS (2)

CONTINUED
TO DRAIN

NOT BY $H_2O$ Innovation — SKID BY $H_2O$ Innovation

HOA O/C
HS YC (3)
FY 24 VDC
IA S EXH
TYPICAL AUTOMATED VALVE

SIGNAL
FROM PROCESS VARIABLE
PID SPD START FLT RUN HOA
FIC SI YC YA YI HS
SC
M 480 VAC, 60Hz, 3PH
TYPICAL PUMP MOTOR WITH VFD

NOTES:

1. ALLOW FOR 2 x AI AND 1 x DO IN ELECTRICAL DESIGN FOR ADDITION OF NEUTRALIZATION INSTRUMENTATION ALLOW SPACE AS WELL.



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INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±1/64"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/64"
HOLE CENTERS: ±1/32"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE
ULTRA FILTRATION MEMBRANE PILOT

TITLE:
UF CIP SYSTEM
W/ VFD CONTROLLED PUMP
PROCESS & INSTRUMENTATION DIAGRAM

SCALE: N/A
DRAWING NUMBER: C53855-C01-0370
SHEET: 1 of 1
REVISION: 4

CONTINUES

CONTINUED

UF FILTRATE
C01-0310 SHT 1
FROM UF MODULES

3" SCH80 PVC

VB-36226
1"

4" PVC SCH80

FILTRATE TANK
T-36200

0 TO 100 IN H2O
LIC 36260 L
LT 36260
1/2"
24 VDC

2" SCH80 PVC

HV-36278

3" PVC SCH80

3"
2"

BACKWASH PUMP
P-36000

CV-36051

0-100 GPM
FX 36000
FI 36074
HH
H
L
LL
AI

FIT 36074
120 VAC

2" PVC SCH80

1"
2"

FILTRATE
C01-0370 SHT 1
TO CIP TANK

BACKWASH WATER
C01-0310 SHT 1
TO UF MODULES

4" PVC SCH80

TREATED WATER

CONTINUED

CONTINUES

SKID BY $H_2O$ Innovation
NOT BY $H_2O$ Innovation

SIGNAL
FROM PROCESS VARIABLE

PID FIC | SPD SI | START YC | FLT YA | RUN YI | HOA HS

SC

M 480 VAC, 60Hz, 3PH

TYPICAL PUMP MOTOR WITH VFD

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INTERPRETATION: ANSI Y14.5
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0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±X/64"
HOLE CENTERS: ±X/64"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE

ULTRA FILTRATION MEMBRANE PILOT

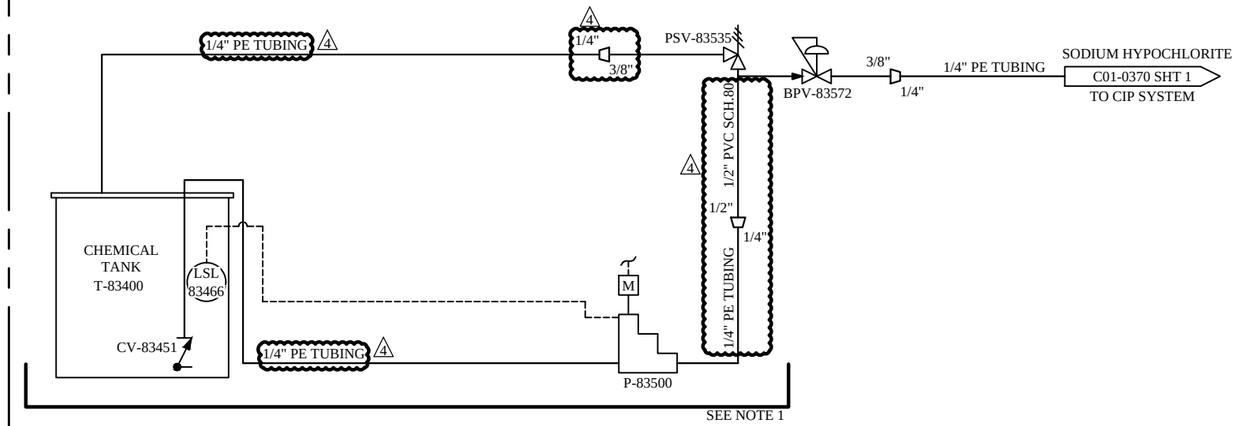
TITLE:
BACK PULSE / FILTRATE PUMP AND TANK
PROCESS & INSTRUMENTATION DIAGRAM

SCALE: N/A

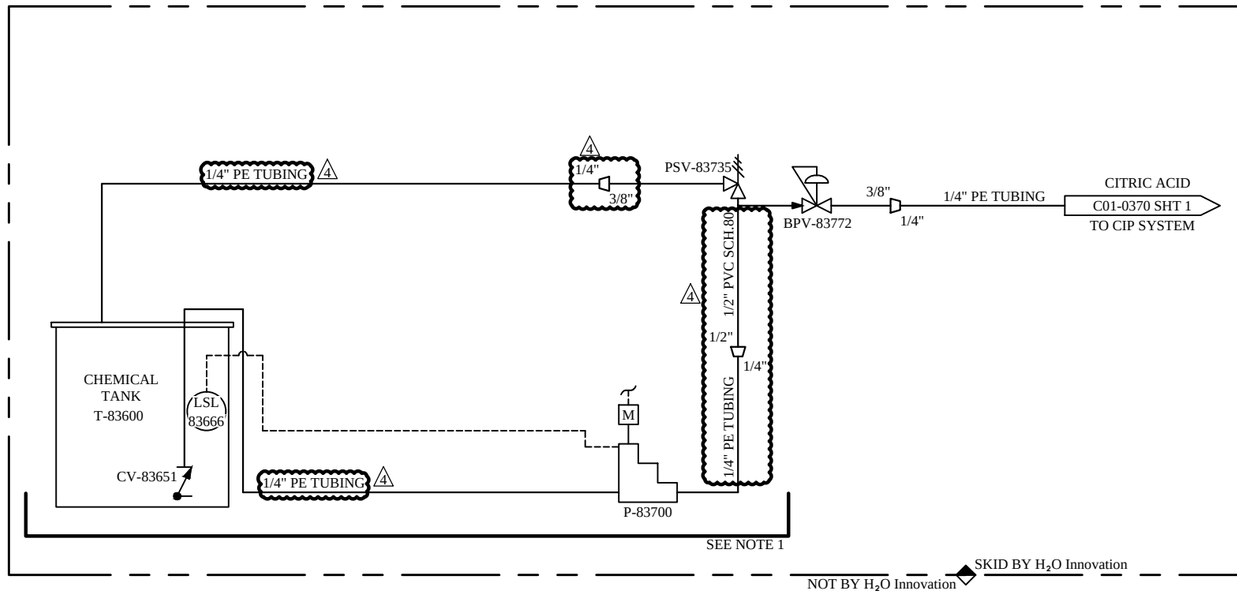
DRAWING NUMBER: C53855-C01-0390

SHEET: 1 of 1

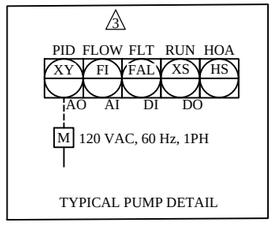
677




SODIUM HYPOCHLORITE (10.3%)
DOSING SYSTEM




CITRIC ACID (50%) DOSING SYSTEM




3 NOTE:
1. SECONDARY CONTAINMENT BIN.
2.PUMP FEED BACK AND ANALOGUE CONTROL MAY NOT BE INCLUDED.



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| REV | DATE (CCYY/MM/DD) | REVISION DESCRIPTION | DRAWN | CHKD | ENG | APPVD |
|---|---|---|---|---|---|---|
| 4 | 2015/10/08 | FIFTH DESIGN SUBMITTAL | MP | DON | DON | MB |
| 3 | 2015/09/21 | FOURTH DESIGN SUBMITTAL | MP | DON | DON | MB |
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| 1 | 2015/08/27 | SECOND DESIGN SUBMITTAL | MP | DON | DON | MB |
| 0 | 2015/08/19 | FIRST DESIGN SUBMITTAL | MP | DON | DON | MB |

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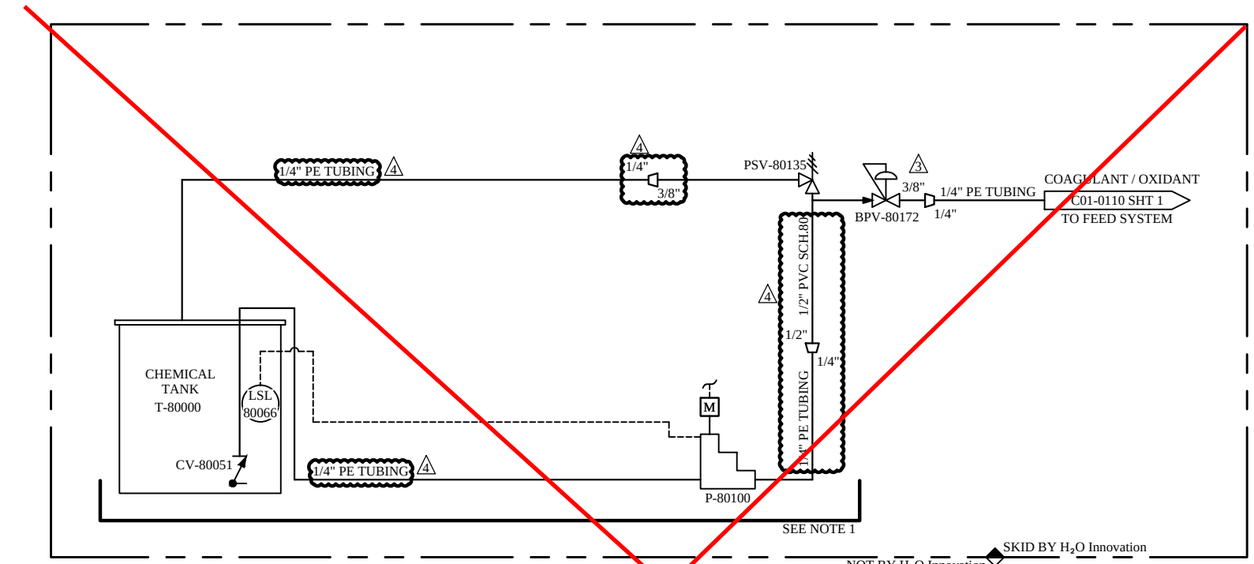
UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±X/□"
DECIMALS X.X: ±0.030
X.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±X/□"
HOLE CENTERS: ±X/□"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE
ULTRA FILTRATION MEMBRANE PILOT

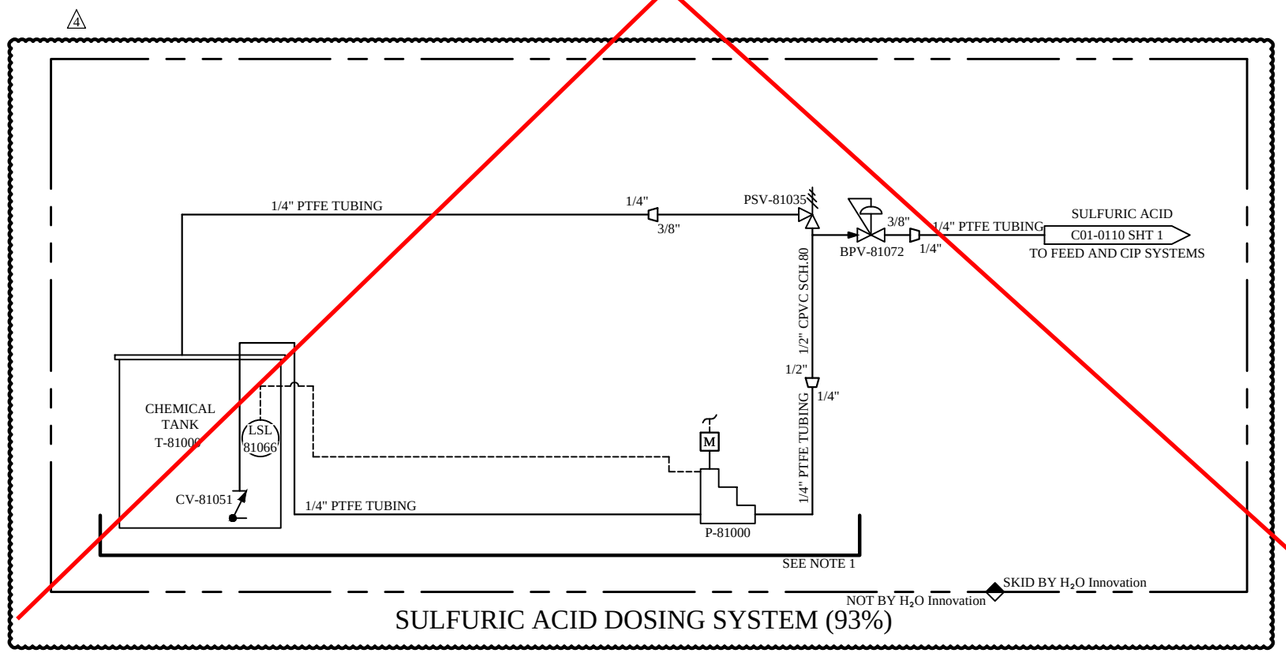
TITLE:
DOSING SKIDS
PROCESS & INSTRUMENTATION DIAGRAM

SCALE: N/A
DRAWING NUMBER: C53855-C01-0800
SHEET: 1 of 5
678

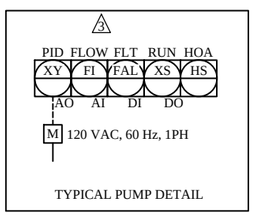
Note: No coagulant or sulfuric acid was used during Georgetown Southside WTP pilot study.




COAGULANT / OXIDANT DOSING SYSTEM




SULFURIC ACID DOSING SYSTEM (93%)




TYPICAL PUMP DETAIL

3

NOTE:
1. SECONDARY CONTAINMENT BIN.
2. PUMP FEED BACK AND ANALOGUE CONTROL MAY NOT BE INCLUDED.



DRAWING REVISION

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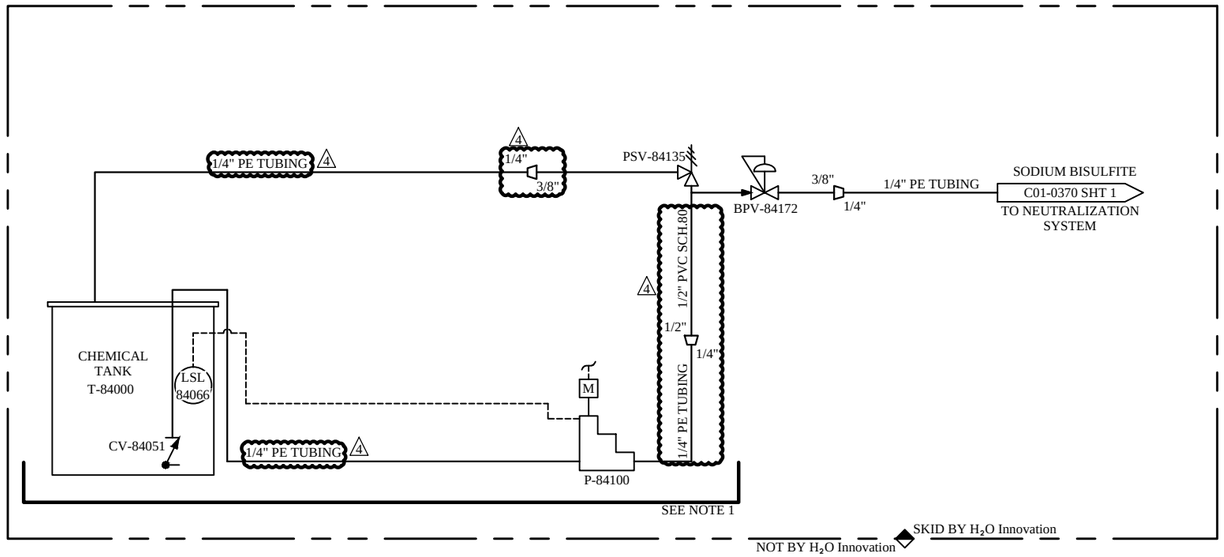
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±1/64"
DECIMALS .X: ±0.030
.XX: ±0.015
.XXX: ±0.5°
ANGLES: ±1/64"
HOLE SIZES: ±1/64"
HOLE CENTERS:
DO NOT SCALE PRINTS

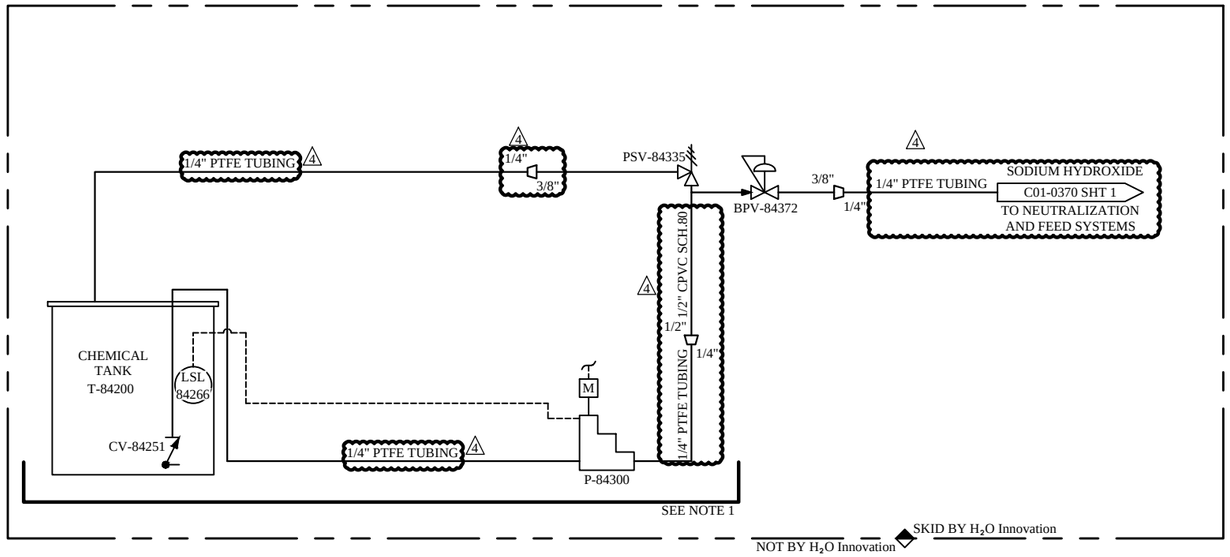
FIBERFLEX PILOT
MODEL : CREME BRULEE
ULTRA FILTRATION MEMBRANE PILOT

TITLE:
DOSING SKIDS
PROCESS & INSTRUMENTATION DIAGRAM

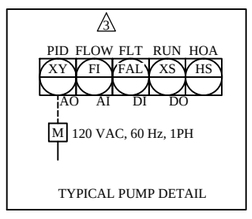
| SCALE: | DRAWING NUMBER: | REVISION |
|---|---|---|
| N/A | C53855-C01-0800 | 4 |
| | SHEET: 2 of 3 | |




SODIUM BISULFITE (38%) DOSING SYSTEM




SODIUM HYDROXIDE (50%) DOSING SYSTEM




TYPICAL PUMP DETAIL

NOTE:
1. SECONDARY CONTAINMENT BIN.
2.PUMP FEED BACK AND ANALOGUE CONTROL MAY NOT BE INCLUDED.



DRAWING REVISION

| REV | DATE (DD/MM/YYYY) | REVISION DESCRIPTION | DRAWN | CHKD | ENG | APPVD |
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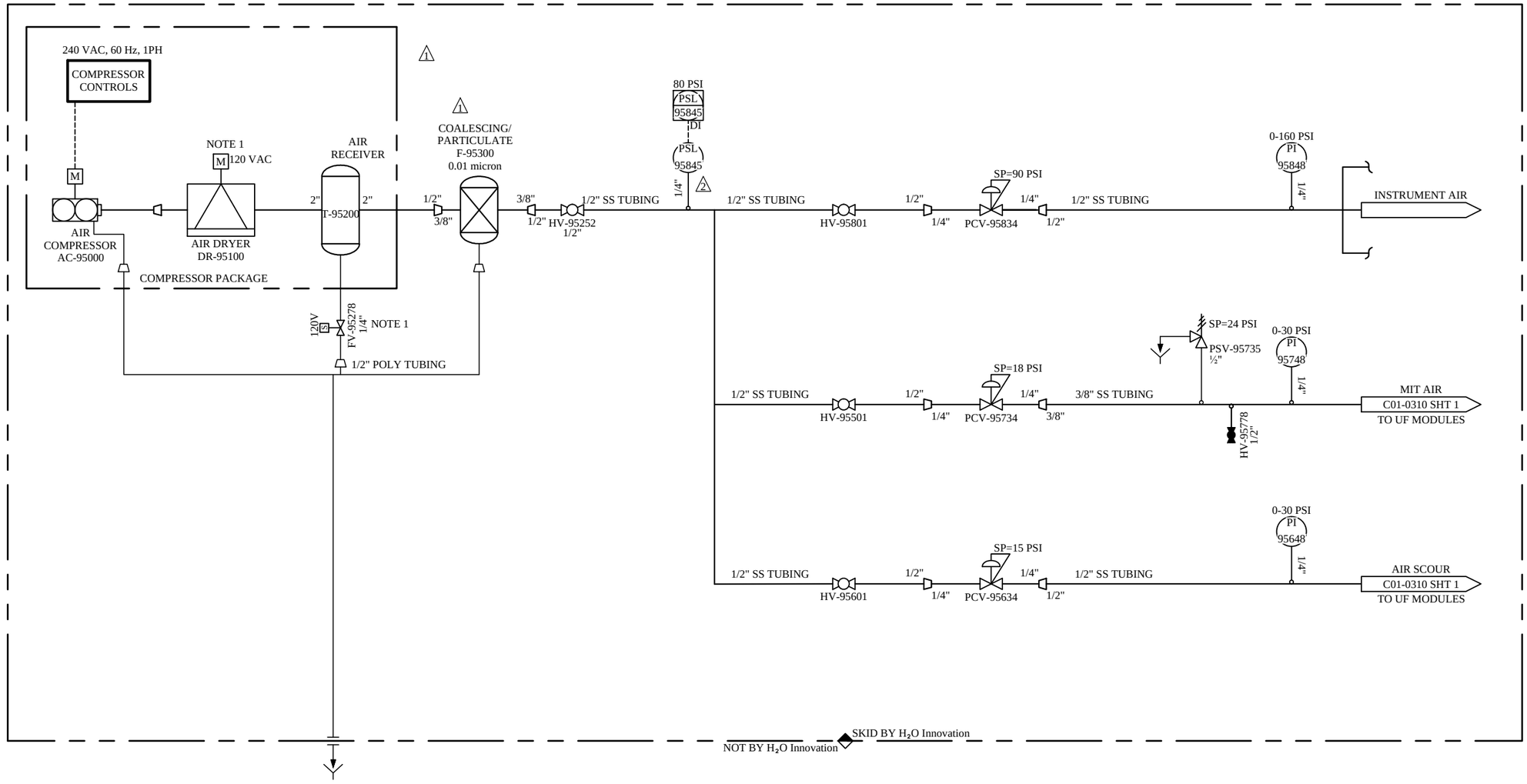
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±1/64"
DECIMALS 0.X: ±0.030
0.0X: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/64"
HOLE CENTERS: ±1/32"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE

ULTRA FILTRATION MEMBRANE PILOT

TITLE:
DOSING SKIDS
PROCESS & INSTRUMENTATION DIAGRAM

| SCALE: | DRAWING NUMBER: | REVISION |
|---|---|---|
| N/A | C53855-C01-0800 SHEET: 3 of 3 | 4 |




1 NOTE:
1. DRAIN VALVE REQUIRES 120V POWER FEED; NO LOGIC.

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UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±X"
DECIMALS X.X: ±0.030
X.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±X"
HOLE CENTERS: ±X"
DO NOT SCALE PRINTS

FIBERFLEX PILOT
MODEL : CREME BRULEE

ULTRA FILTRATION MEMBRANE PILOT

TITLE:
AIR COMPRESSOR SYSTEM
PROCESS & INSTRUMENTATION DIAGRAM

SCALE: N/A

DRAWING NUMBER: C53855-C01-0950

SHEET: 1 of 1

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DON

# MEMBRANE MODULE TECHNICAL DATA SHEETS

| **TORAYFIL**™ Pressurized Hollow-fiber Membrane Module Specifications | | | | |
|---|---|---|---|---|
| Module Part Number | | HFU**G**-2020**AN** | HFU-2020**N** / HFU-2020**AN** | |
| Molecular Weight Cut-off | **Daltons** | 150,000 | | |
| Outer Membrane Surface Area | **ft² (m²)** | 969 (90) | 775 (72) | 775 (72) |
| Maximum Feed Water Flow | **gpm (m³/h)** | 66 (15) | 53 (12) | 53 (12) |
| Maximum Backwash Flow | **gpm (m³/h)** | 74 (16.8) | 59 (13.5) | 59 (13.5) |
| Maximum Air Flow | **scfm (Nm³/h)** | 5.3 (9) | 5.3 (9) | 5.3 (9) |
| Filtration Method | | Pressure type / Outside to inside / Dead-end | | |
| Dimensions | Diameter | **in (mm)** | 8.5 (216) | |
| | Length | **ft (mm)** | 2,160 (7.087) | |
| Weight **lbs (kg)** | Full of water | | 232 (105) | 243 (110) | 203 (92) |
| | After draining | | 112 (51) | 148 (67) | 108 (49) |
| Materials | Membrane | | PVDF (Polyvinylidene fluoride) | |
| | Casing / Protective Cylinder | | PVC (Polyvinychloride) | |
| | Potting | | Epoxy resin | |
| Cap & Nut (housing) | | | Integrated | Separate | Integrated |
| Connection | Top | | Housing joints 80A | |
| | Bottom | | Housing joints 80A | |
| | Side | | Housing joints 65A | |
| Maximum inlet pressure | **psi (kPa)** | 44 (300) | | |
| Maximum backwash pressure | **psi (kPa)** | 44 (300) | | |
| Normal operating trans-membrane pressure | **psi (kPa)** | 0–29 (0–200) | | |
| Operating temperature range | **°F (°C)** | 32–104 °F (0–40 °C) | | |
| pH range | During filtration | 1–10 | | |
| | During cleaning | 0–12 | | |

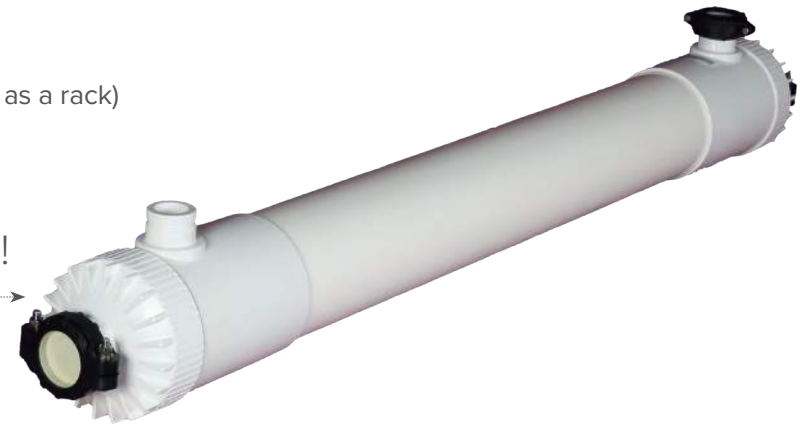
Specifications subject to change without notice

KEY BENEFITS

1. 30% smaller footprint design (compared to HFU as a rack)
2. 10% initial cost reduction (less pipes and valves)
3. Increased flow capacity

## **HFU"G"** for gigantic performance!

Cap & nut for new AN-type are integrated into the housing



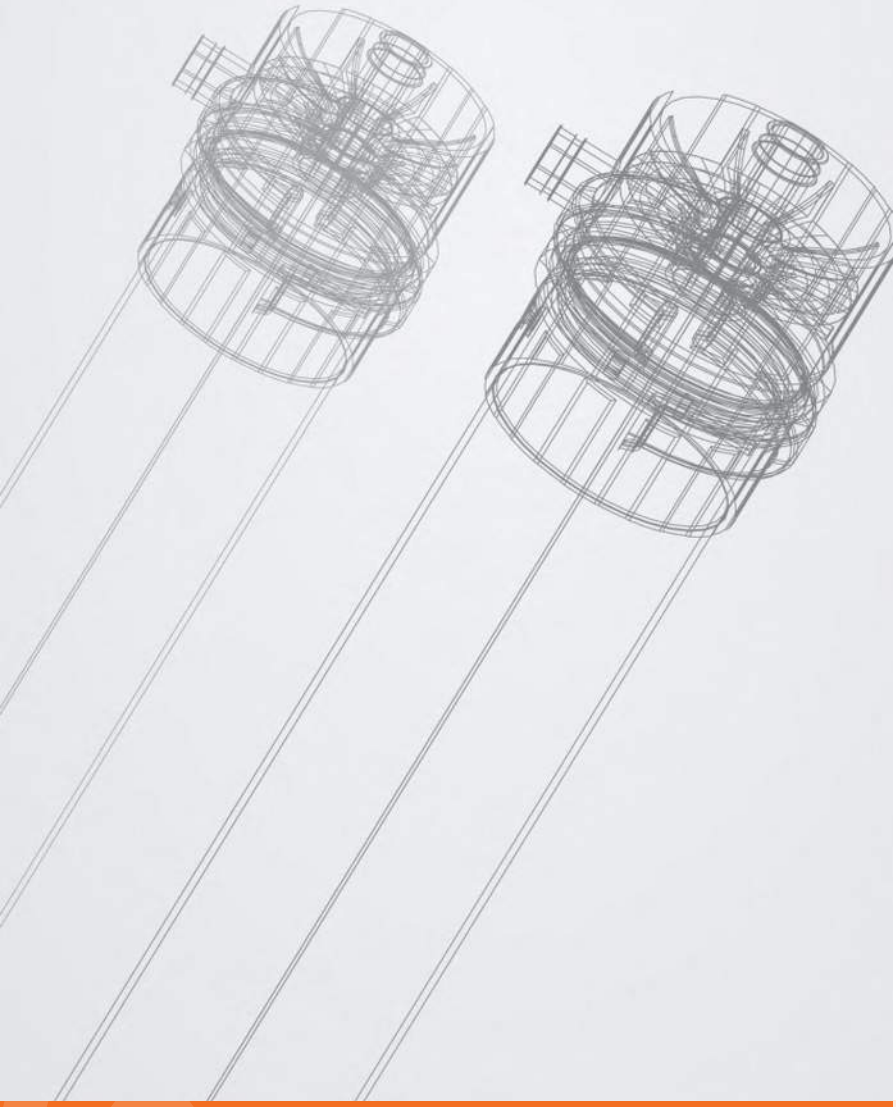
TORAY Innovation by Chemistry

**TORAY MEMBRANE USA, INC. (TMUS)**
13435 Danielson Street, Poway, CA 92064, U.S.A.
Tel: +1 (858) 218-2360 / Fax: +1 (858) 218-2380
WWW.TORAYWATER.COM / INNOVATION@TORAYMEM.COM



MC-MB2HFUG-1805

Scinor



# Scinor® SMT600–P80

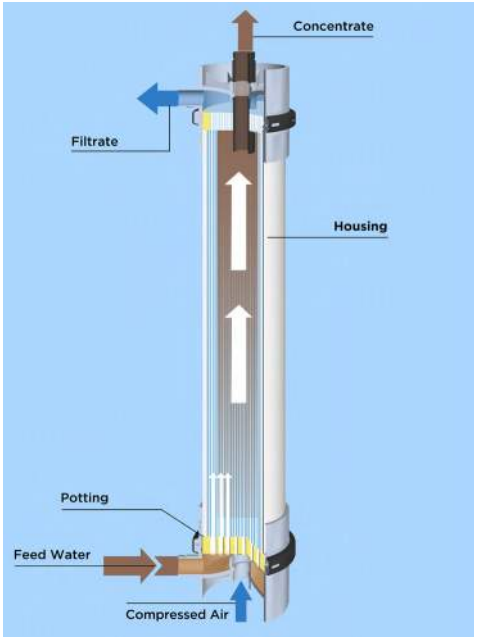
## Pressurized Ultrafiltration Module

### One of the largest pressurized ultrafiltration modules in the market

Scinor SMT600 series ultrafiltration modules utilizing our state-of-the-art Thermally Induced Phase Separation (TIPS) PVDF membranes provide the highest permeability, mechanical strength, and chemical tolerance in the industry. These modules are ideal for use in potable water, wastewater, desalination, and industrial applications. The SMT600-P80 retrofits major membrane vendor installations giving end-users a choice when replacing membranes.

The large and reliable SMT600-P80 pressurized ultrafiltration module is suitable for large-scale water treatment plants due to high permeability and high fiber packing density which reduces overall system footprint and lowers system capital cost.

The SMT600-P80 is an outside-in configuration module that operates in dead-end or cross-flow mode depending on specifics of the application. Cleaning processes used are simple backwash, maintenance clean, and Clean-in-Place.




## Product Advantages

**Excellent Filtered Water Quality**
- Tight 0.1 µm pore size distribution
- Low fiber breakage rate

**Long Operational Life**
- High mechanical strength and durability
- >5000 mg/L Sodium Hypochlorite tolerance

**Low Requirements for Pretreatment**
- Outside-in configuration
- Optimal flow channel

**Low Operating and Maintenance Requirements**
- Low energy and chemical consumption due to higher permeability
- Automatic operation

**Low Capital Cost**
- High flux rates on all water sources

**Small Footprint**
- High hollow-fiber packing density
- Large 80m$^2$ module building blocks

**Retrofit modules available for all major membrane suppliers**

**Scinor Water America, LLC**

40 Wall Street, 28th Floor
New York, NY 10005
800.774.1385

Please visit **scinor.com** for further information.

Certified to NSF/ANSI 61

# Specifications

| | | |
|---|---|---|
| Scinor® Module | Part Number | SMT600-P80 |
| | Fiber Material | Polyvinylidene Fluoride (PVDF) |
| | Effective Area | 861 $ft^2$ (80 $m^2$) |
| | Nominal Pore Size | 0.1 μm |
| | Fiber ID/OD | 0.7 mm/1.3 mm |
| | Geometry | Φ225 mm × 2360 mm |
| | Port Size | DN50 |
| | Housing/Head Material | U-PVC/ABS |
| | Potting Material | Epoxy Resin |
| Operating Parameters | Temperature | 33-104° F (1-40 C) |
| | pH Range | 1-11 Continuous |
| | Max. NaClO | 5000 mg/L |
| | Backwash Flux | 30-70 gfd (50-120 lmh) |
| | Air Scour Flow | 3.1-7.5 scfm/module (5-12 $Nm^3$/hr/module) |
| | CIP pH Range | 1-13 |
| | Max. Feed Pressure | 60 psi (0.4 MPa) |
| | Max. TMP | 45 psi (0.3 MPa) |
| | Operating TMP | 3-22 psi (0.02-0.15 MPa) |
| | Max. Air Scour Pressure | 36 psi (0.25 MPa) |
| | Max. Backwash Pressure | 36 psi (0.25 MPa) |
| Filtered Water Performance | Turbidity | ≤0.1 ntu |
| | Silt Density Index | ≤3 |
| | E.Coli Removal | non-detect |


Drinking Water


Wastewater


Desalination


Industrial

Scinor

Product Data Sheet

# DOW IntegraFlux™ Ultrafiltration Modules

Model SFP-2860XP, SFD-2860XP, SFP-2880XP and SFD-2880XP

## Features

DOW IntegraFlux™ Ultrafiltration (UF) modules with XP fiber are made from high permeability, high mechanical strength, hollow fiber PVDF membranes. The modules provide excellent performance, industry leading membrane area with low energy and chemical consumption. IntegraFlux modules have the following general properties and characteristics:

- Up to 35% higher permeability than previous generation modules helping to improve operating efficiencies and productivity
- 0.03 µm nominal pore diameter for removal of bacteria, viruses, and particulates including colloids to protect downstream processes such as RO
- PVDF polymeric hollow fibers for high mechanical strength with excellent chemical resistance providing long membrane life and reliable operation
- Outside-In flow configuration allowing a wide range of solids in the feed water minimizing the need for pretreatment processes and reducing the backwash volume compared to Inside-Out configurations


These modules are an excellent choice for systems with capacities greater than 50 $m^3$/hr (220 gpm). The shorter SFP-2860XP or SFD-2860XP modules are well suited for installations with limited height. Larger and longer, 8 inch diameter and 80 inch in length, the SFP-2880XP or SFD-2880XP modules offer a high effective membrane area combined with high permeability that provides the most economical and efficient membrane system design.

DOW IntegraFlux Ultrafiltration Modules can be used for a wide variety of treatment applications such as industrial and municipal wastewaters, surface water, and seawater.

## Product Specifications

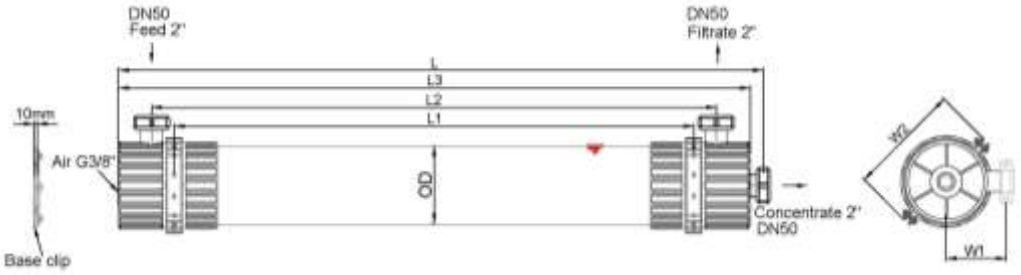
| Product | Type | Membrane Area | | Volume | | Weight (empty/water filled) | |
|---|---|---|---|---|---|---|---|
| | | $m^2$ | $ft^2$ | liters | gallons | kg/lbs | kg/lbs |
| **SFP-2860XP** | Industrial | 51 | 549 | 35 | 9.3 | 48/83 | 106/183 |
| **SFD-2860XP** | NSF/ANSI 61 and 419 | 51 | 549 | 35 | 9.3 | 48/83 | 106/183 |
| **SFP-2880XP** | Industrial | 77 | 829 | 39 | 10.3 | 61/100 | 135/220 |
| **SFD-2880XP** | NSF/ANSI 61 and 419 | 77 | 829 | 39 | 10.3 | 61/100 | 135/220 |





Form No. 795-50222, Rev 2
September 2015

**Figure 1** SFP-2860XP, SFD-2860XP, SFP-2880XP, and SFD-2880XP (8-inch diameter)




| Product | Units | Length | | | | Diameter | Width | |
|---|---|---|---|---|---|---|---|---|
| | | L | L1 | L2 | L3 | D | W1 | W2 |
| SFP-2860XP and SFD-2860XP | SI (mm) | 1860±3 | 1500 | 1630±3 | 1820±3 | 225 | 180 | 342 |
| | US (inch) | 73.2±0.1 | 59.1 | 64.2±0.1 | 71.7±0.1 | 8.9 | 7.1 | 13.5 |
| SFP-2880XP and SFD-2880XP | SI (mm) | 2360±3 | 2000 | 2130±3 | 2320±3 | 225 | 180 | 342 |
| | US (inch) | 92.9±0.1 | 78.7 | 83.9±0.1 | 91.3±0.1 | 8.9 | 7.1 | 13.5 |

## Operating Limits

| | SI Units | US Units |
|---|---|---|
| Filtrate Flux (25ºC) | 40 – 110 l/m$^2$hr | 24 – 65 gfd |
| Flow Range Per Module[1] | 2.0 – 8.5 m$^3$/hr | 8.8 – 37.4 gpm |
| Temperature | 1 – 40ºC | 34 – 104ºF |
| Maximum Inlet Module Pressure (20ºC) | 6.25 bar | 90.65 psi |
| Maximum Operating TMP | 2.1 bar | 30.5 psi |
| Maximum Operating Air Scour Flow | 12 Nm$^3$/hr | 7.1 scfm |
| Maximum Backwash Pressure | 2.5 bar | 36 psi |
| Operating pH | 2 – 11 | |
| Maximum NaOCl | 2,000 mg/L | |
| Maximum Particle Size | 300 µm | |
| Flow Configuration | Outside in, dead end flow | |
| Expected Filtrate Turbidity | ≤ 0.1 NTU | |
| Expected Filtrate SDI | ≤ 2.5 | |

[1] Flow range represents DOW™ Ultrafiltration SFP-2860XP, SFD-2860XP, SFP-2880XP, and SFP-2880XP Modules for filtrate flux range shown

## Important Information

Proper start-up of an ultrafiltration system is essential to prepare the membranes for operating service and to prevent membrane damage. Following the proper start-up sequence also helps ensure that system operating parameters conform to design specifications so that system water quality and productivity goals can be achieved.

Before initiating system start-up procedures, membrane pretreatment, installation of the membrane modules, instrument calibration and other system checks should be completed.

Please refer to the DOW™ UF Product Manual.

## Operation Guidelines

Avoid any abrupt pressure variations during start-up, shutdown, cleaning or other sequences to prevent possible membrane damage. Flush the ultrafiltration system to remove shipping solution prior to start-up. Remove residual air from the system prior to start-up. Manually start the equipment. Depending on the application, filtrate obtained from initial operations should be discarded.

Please refer to the DOW™ UF Product Manual.

## General Information

- If operating limits and guidelines given in this bulletin are not strictly followed, the limited warranty will be null and void.
- To control biological growth during extended system shutdowns, it is recommended that storage solution be injected into the membrane modules.

Please refer to the DOW UF Product Manual and Technical Service Bulletins.

## Regulatory Note

NSF/ANSI 61 and 419 certified drinking water modules require specific conditioning procedures prior to producing potable water. Please refer to the product technical manual flushing section for specific procedures. Drinking water modules may be subjected to additional regulatory restrictions in some countries. Please check local regulatory guidelines and application status before use and sales.

## Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

**DOW™ Ultrafiltration**
For more information, call the Dow Water & Process Solutions business:
North America: 1-800-447-4369
Latin America: (+55) 11-5188-9222
Europe: +800-3-694-6367
Italy: +800-783-825
South Africa: +0800 99 5078
Pacific: +800 7776 7776
China: +400 889-0789
www.dowwaterandprocess.com







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September 2015

# PERFORMANCE GRAPHS,
# TORAY

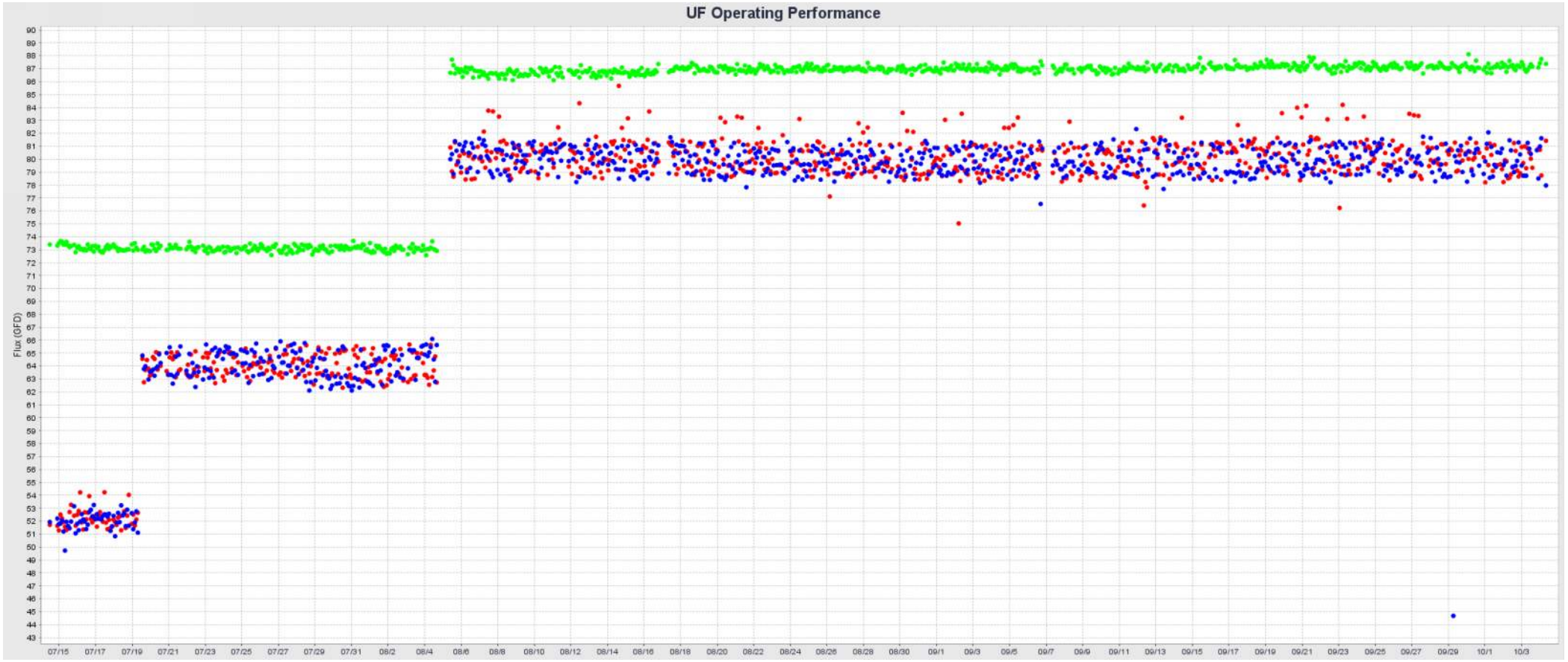



Figure C1 – Instantaneous Flux.

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

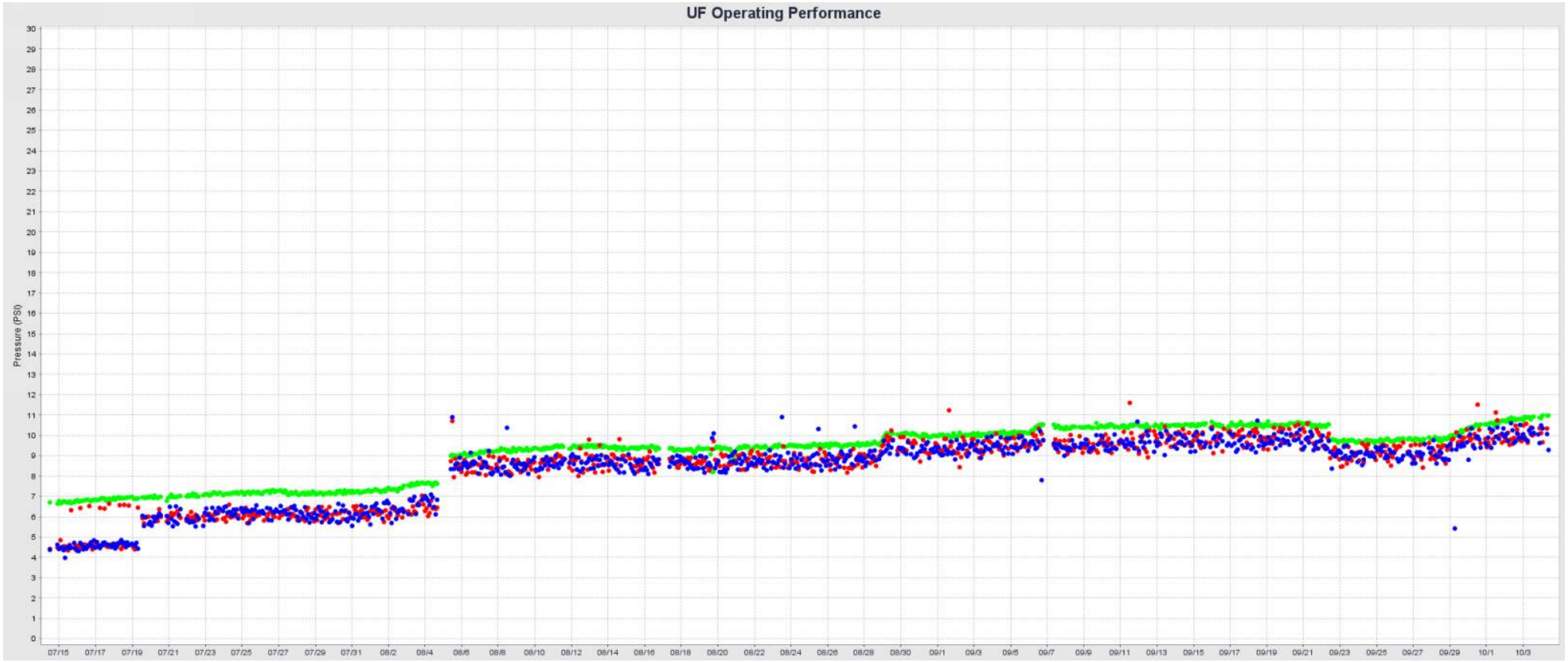



Figure C2 – Transmembrane Pressure (TMP)

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

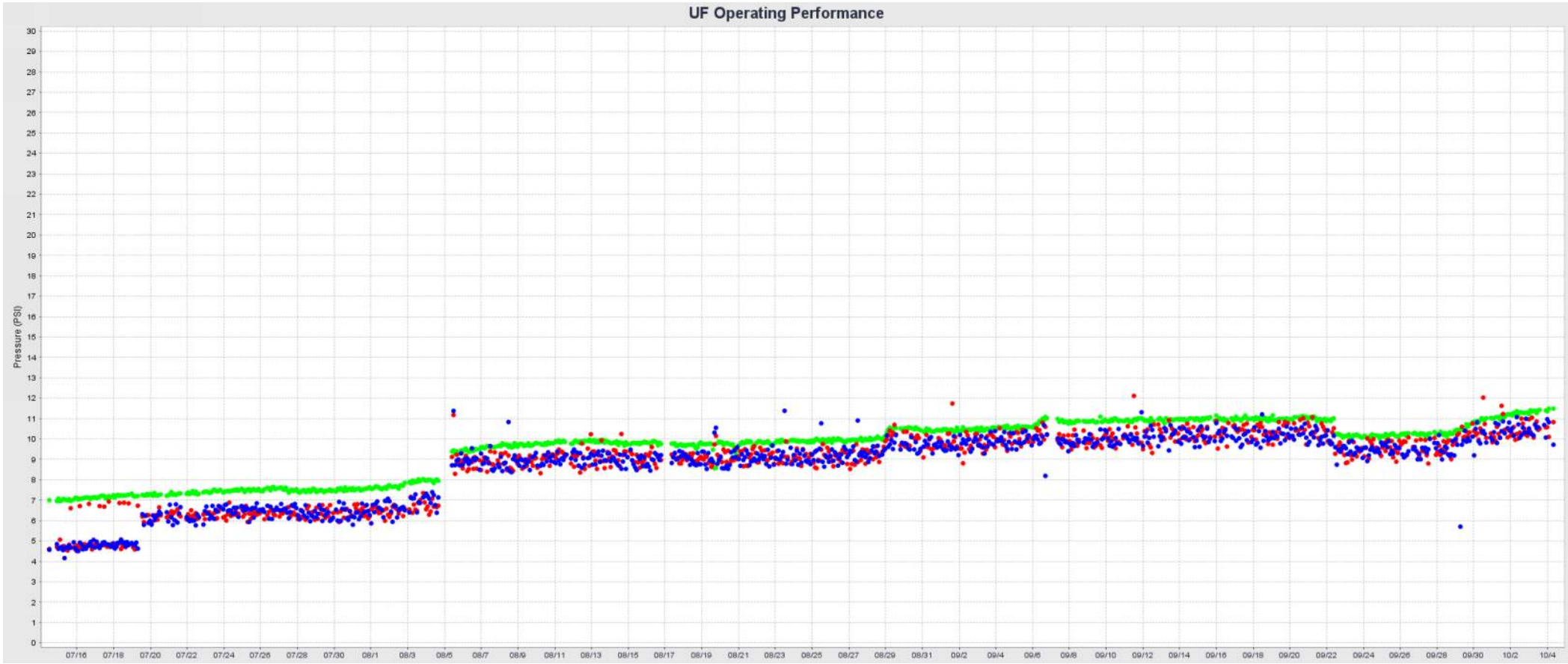



Figure C3 – Transmembrane Pressure (TMP), Temperature Corrected 20 degC

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

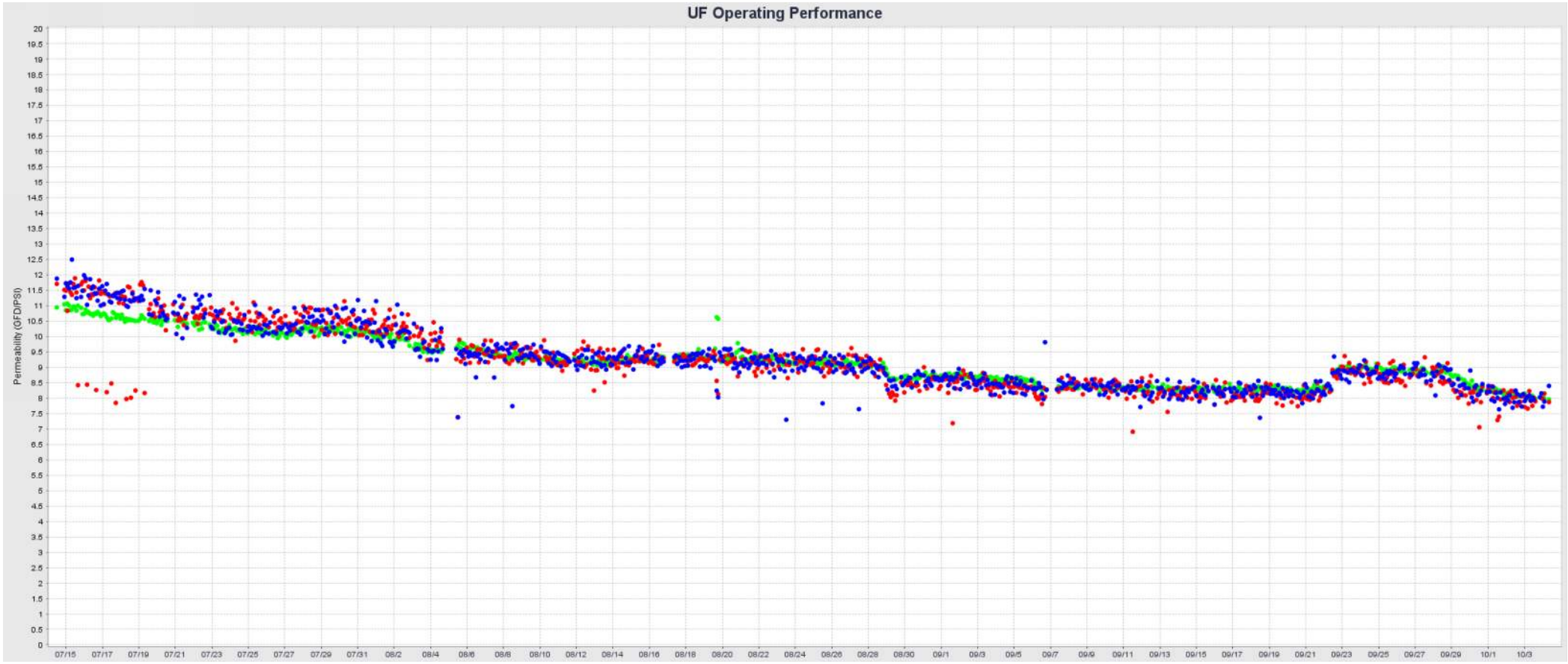



Figure C4 – Permeability

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

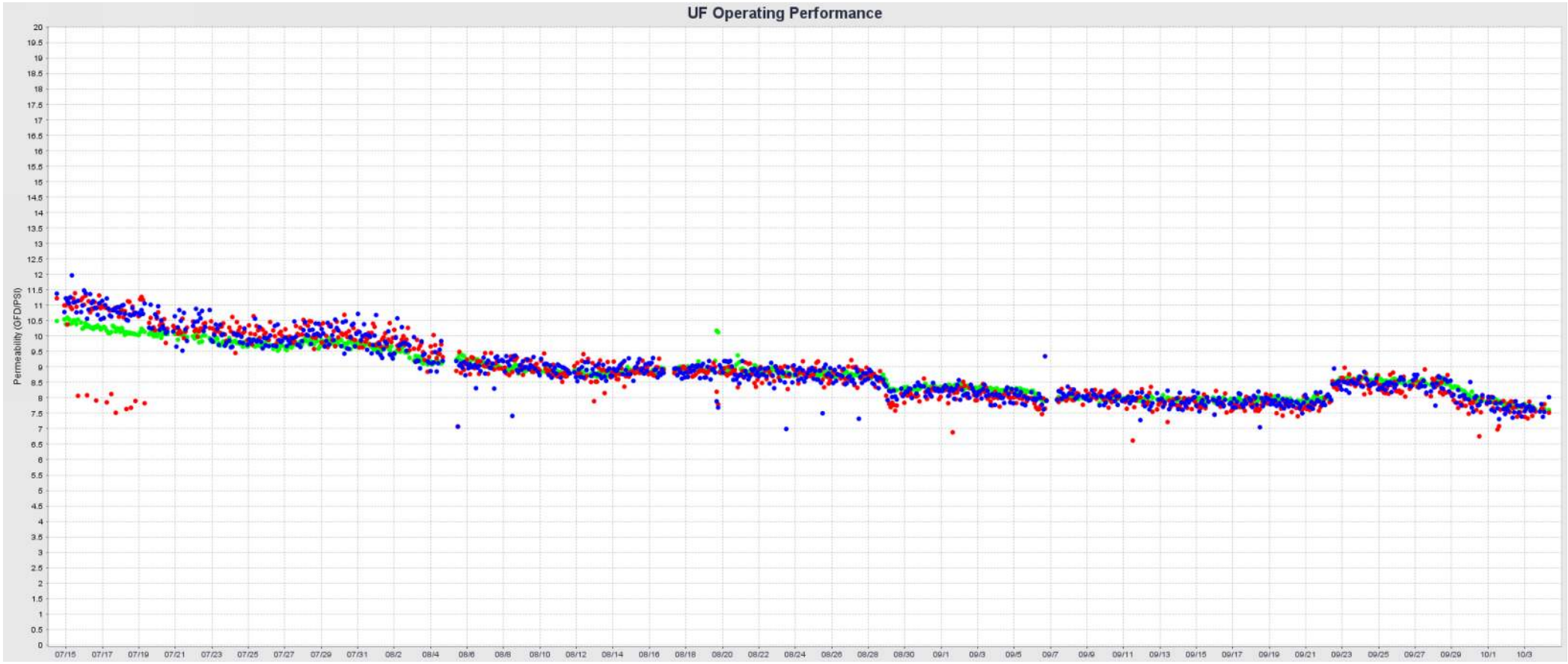



Figure C5 – Permeability, Temperature Corrected 20 degC

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

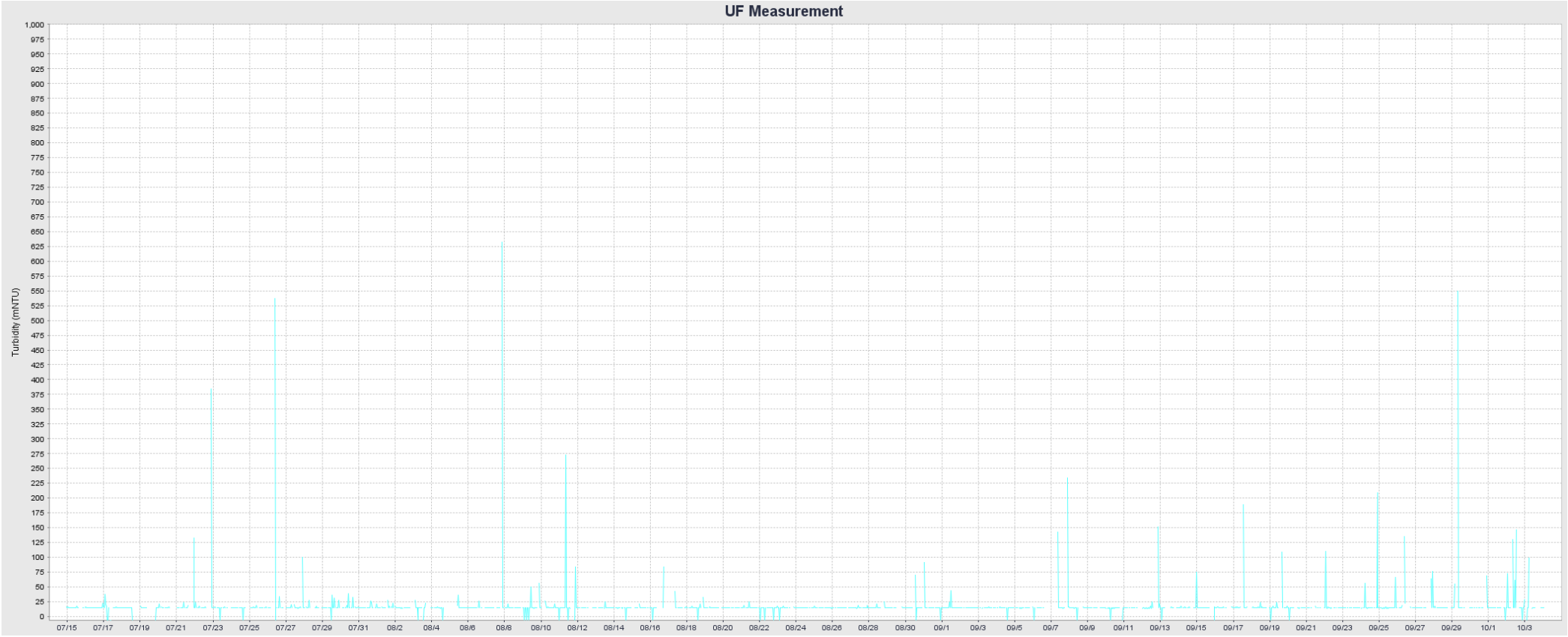



Figure C6 – Filtrate Turbidity

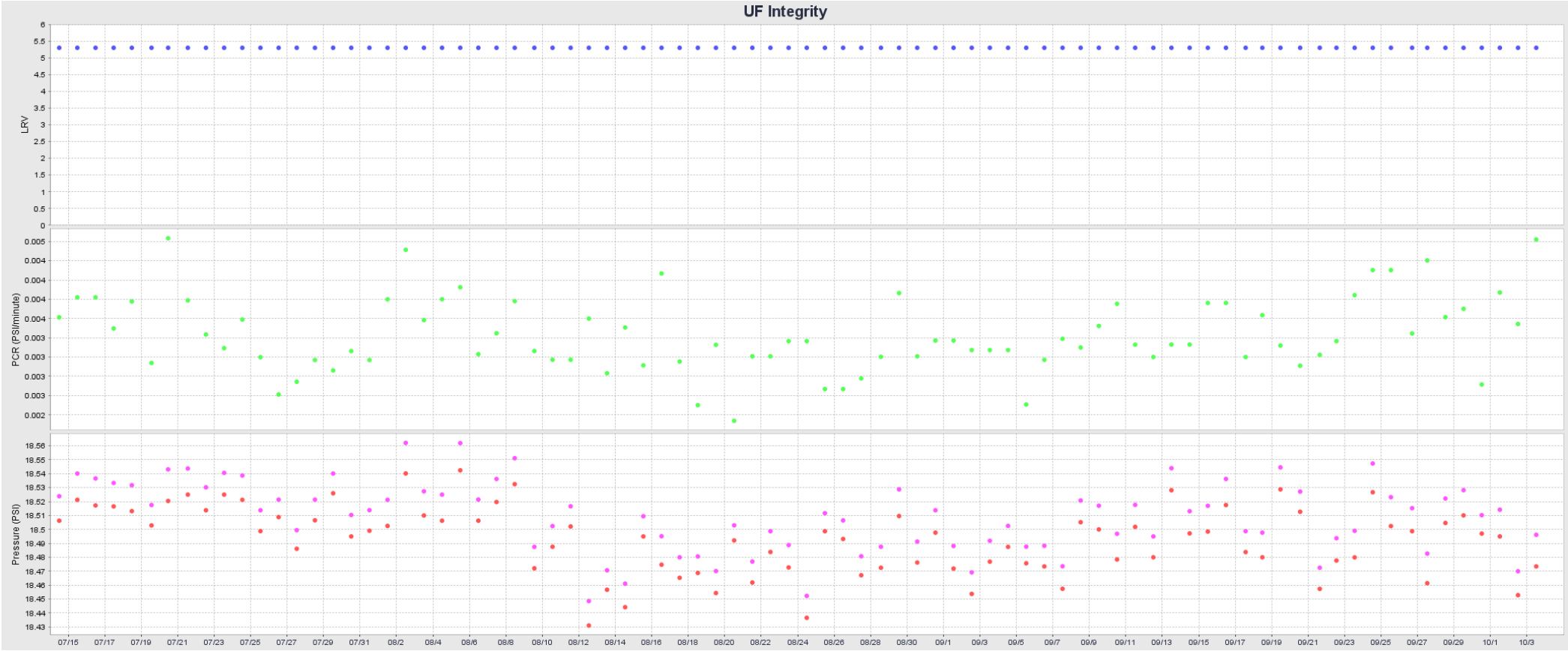



Figure C7 – Membrane Integrity Testing (MIT)

# PERFORMANCE GRAPHS,
# SCINOR

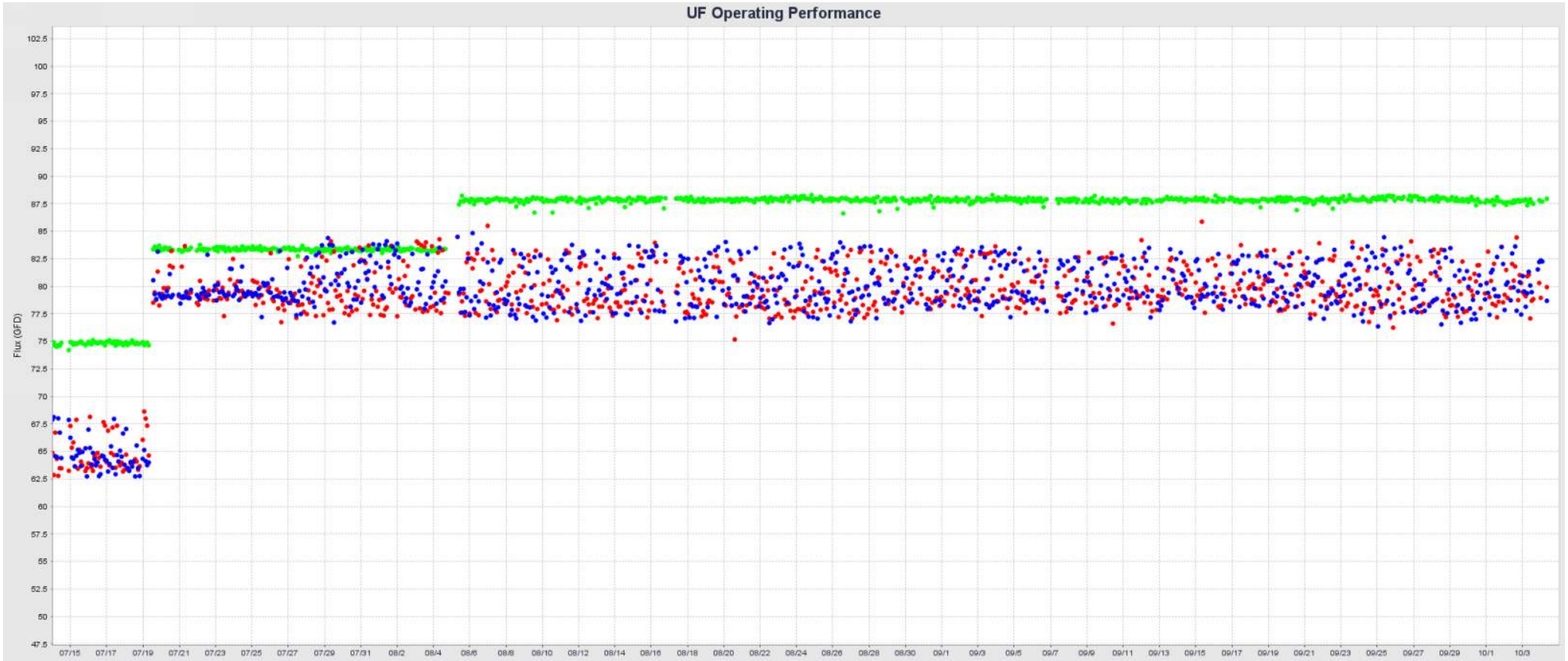



Figure D1 – Instantaneous Flux

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

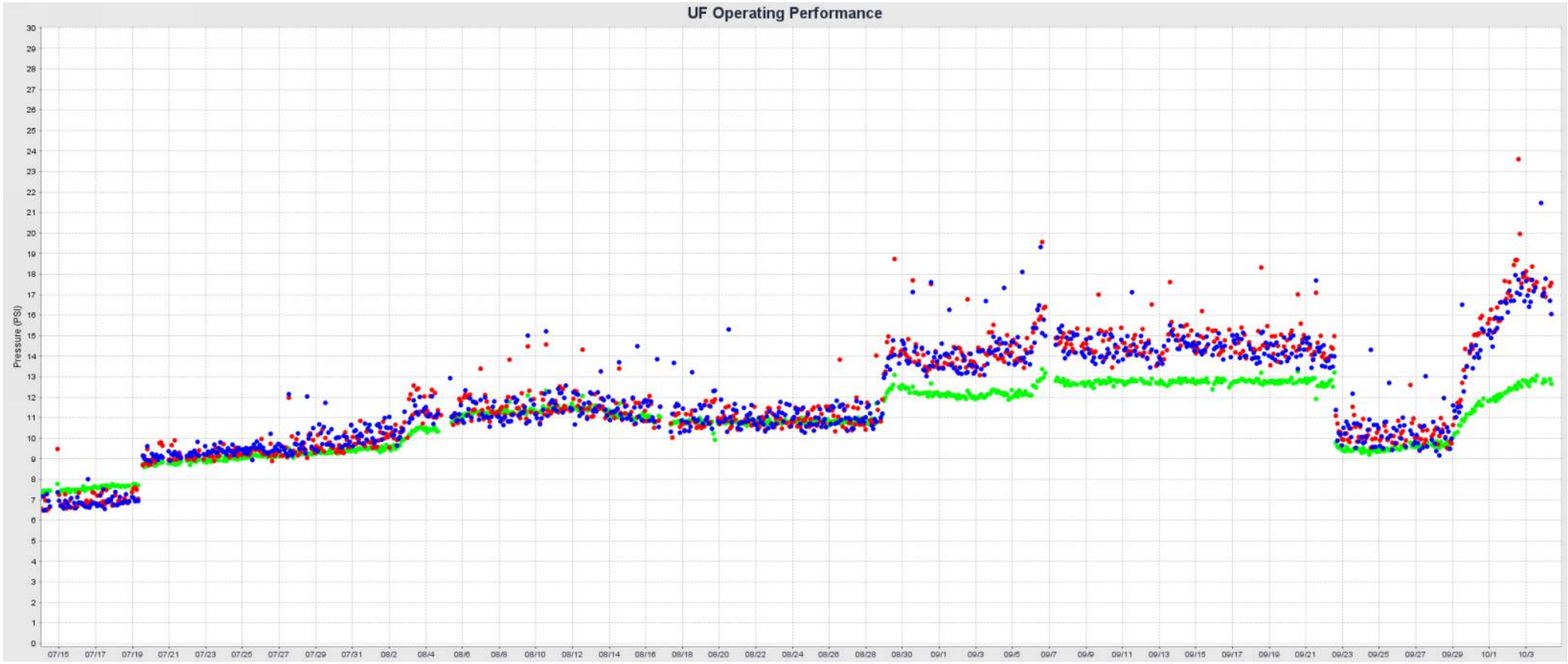



Figure D2 – Transmembrane Pressure (TMP)

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

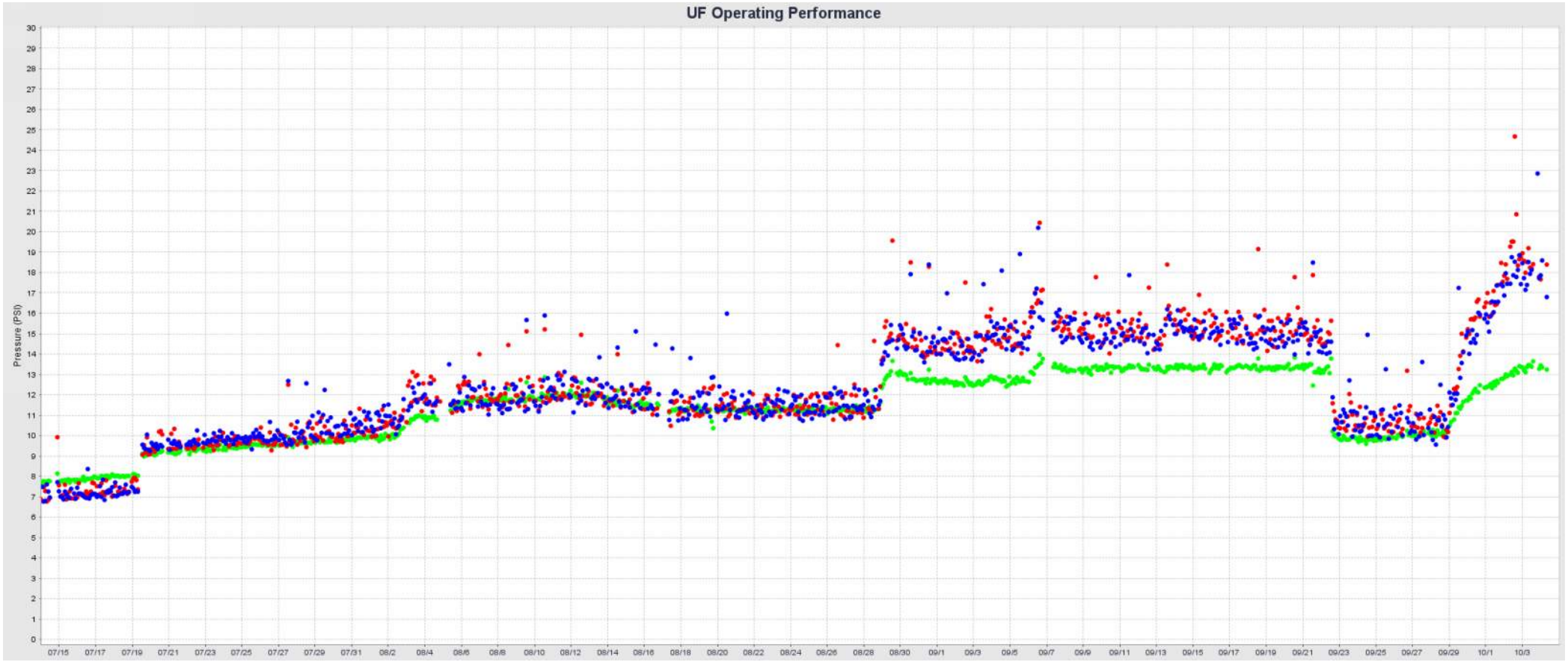



Figure D3 – Transmembrane Pressure (TMP), Temperature Corrected 20 degC

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

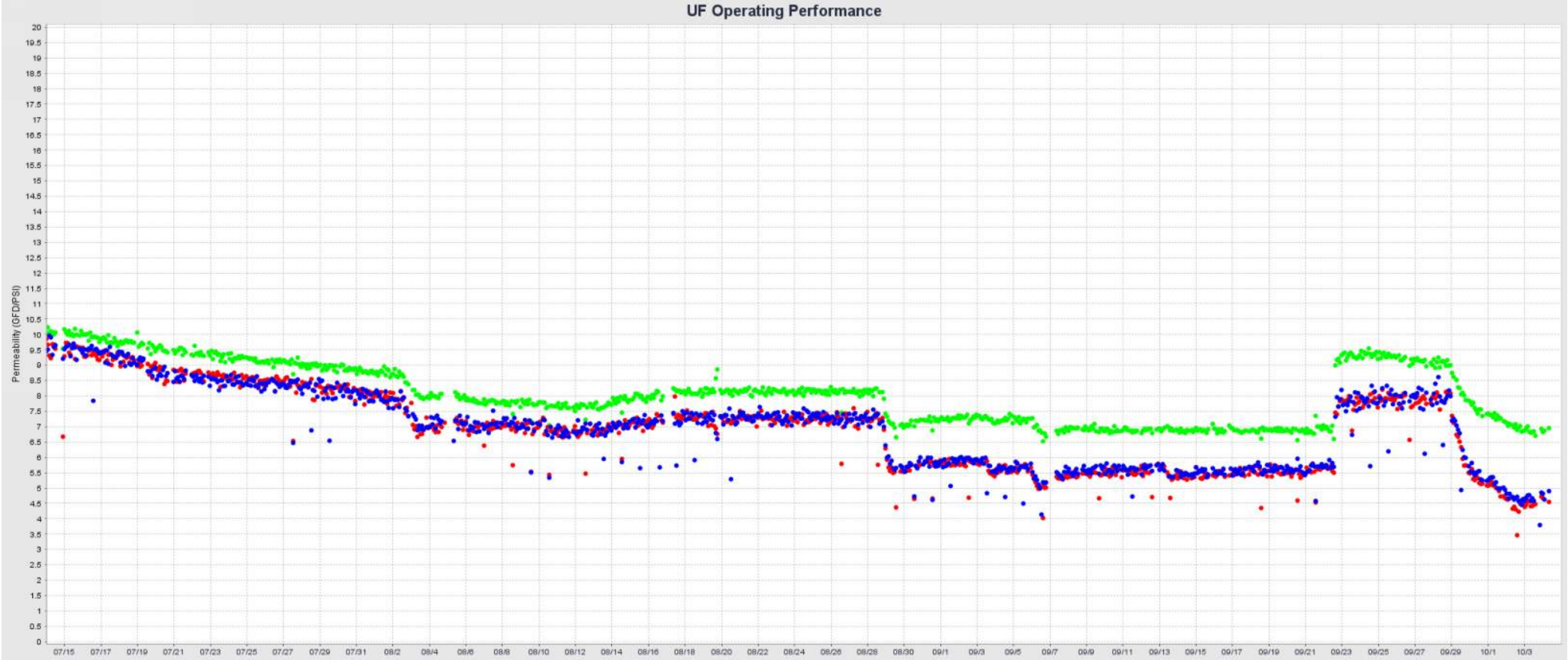



Figure D4 – Permeability

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

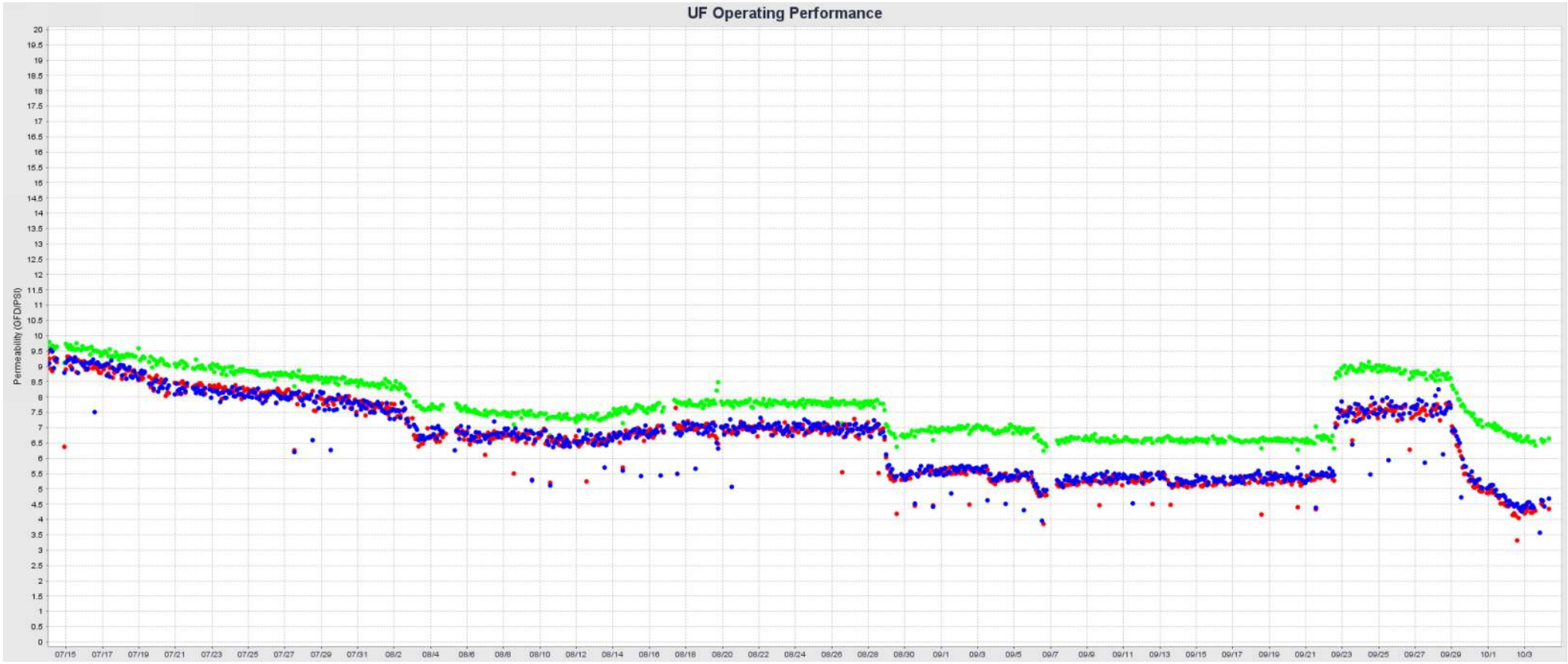



Figure D5 – Permeability, Temperature Corrected 20 degC

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

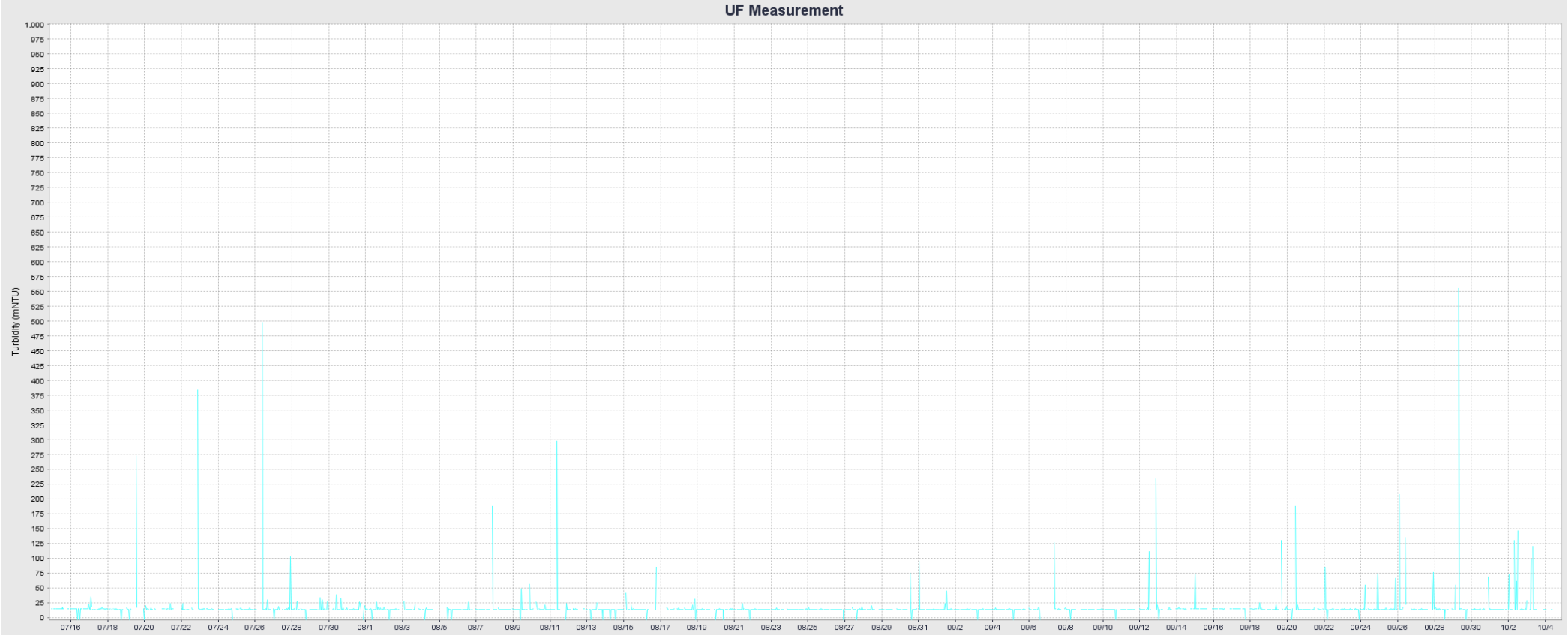



Figure D6 – Filtrate Turbidity

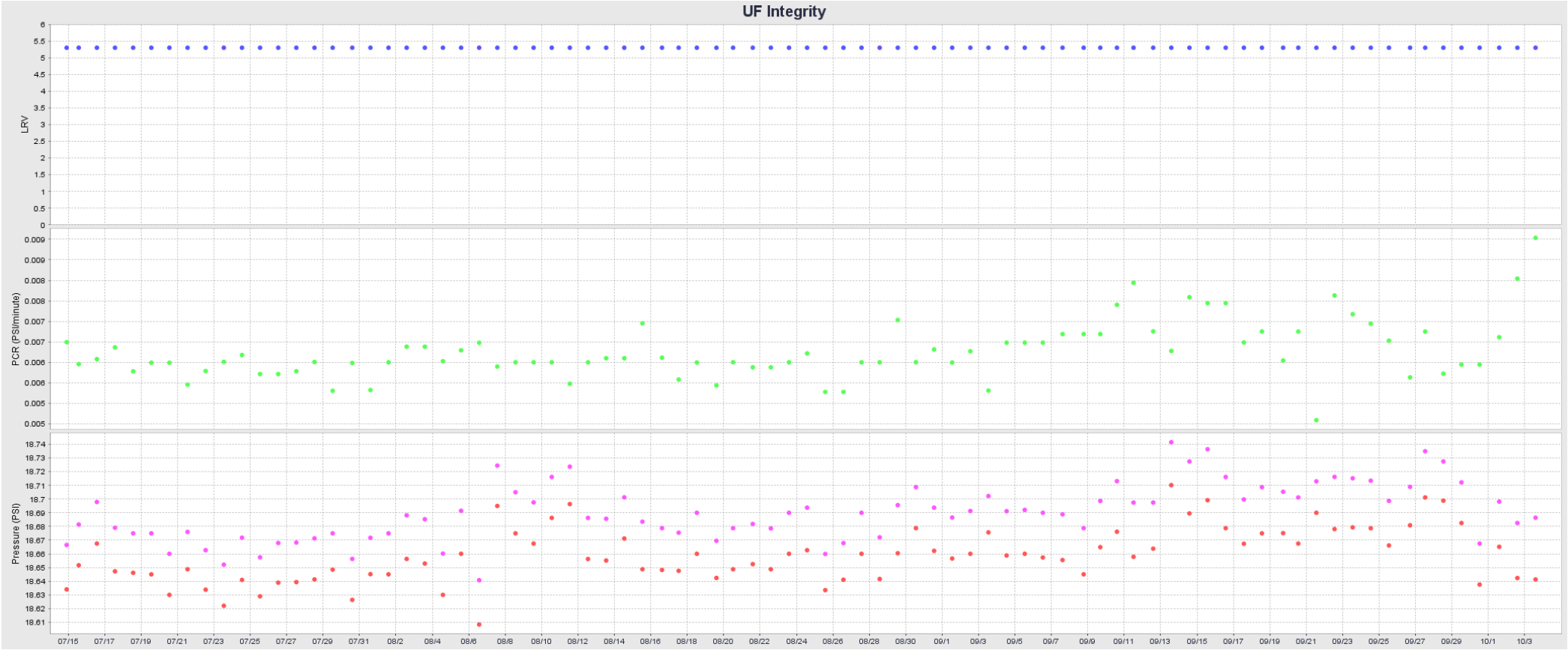



Figure D7 – Membrane Integrity Testing (MIT)

# PERFORMANCE GRAPHS,
# DUPONT

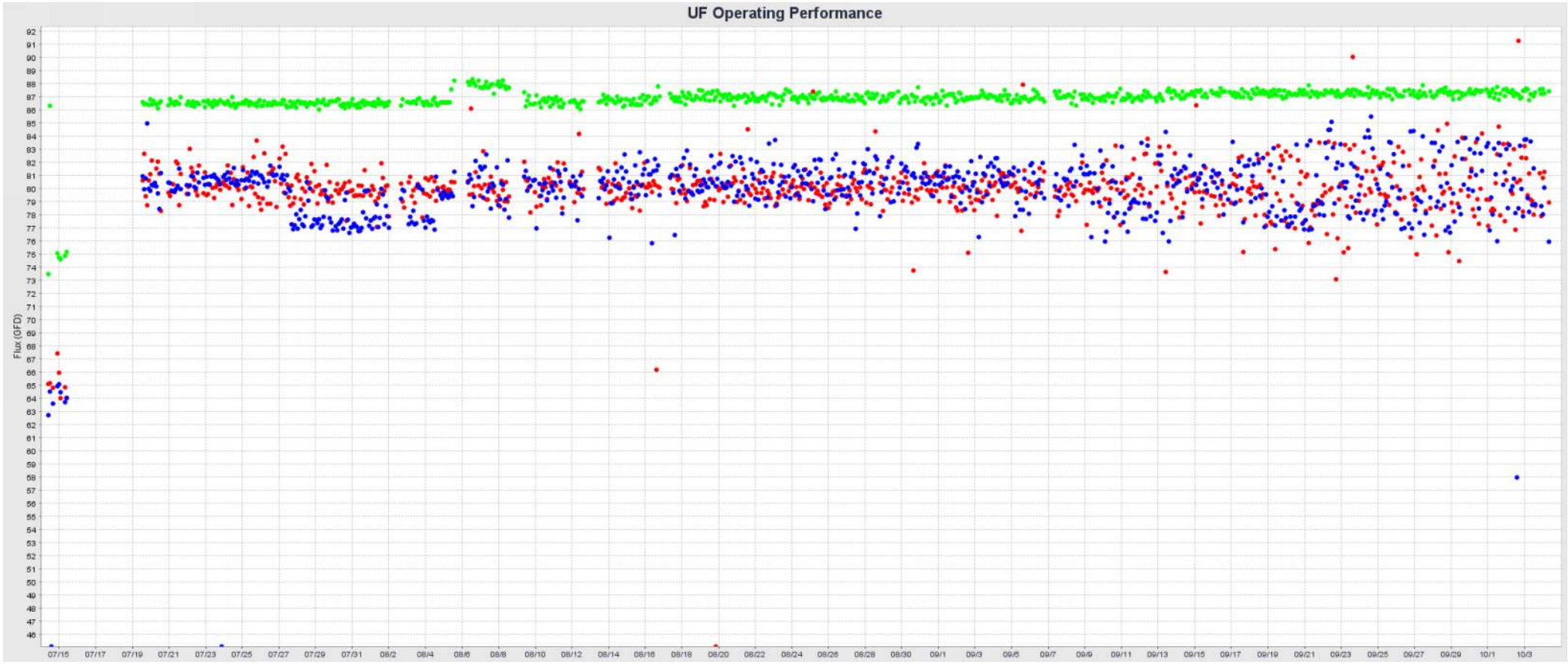



Figure E1 – Instantaneous Flux

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

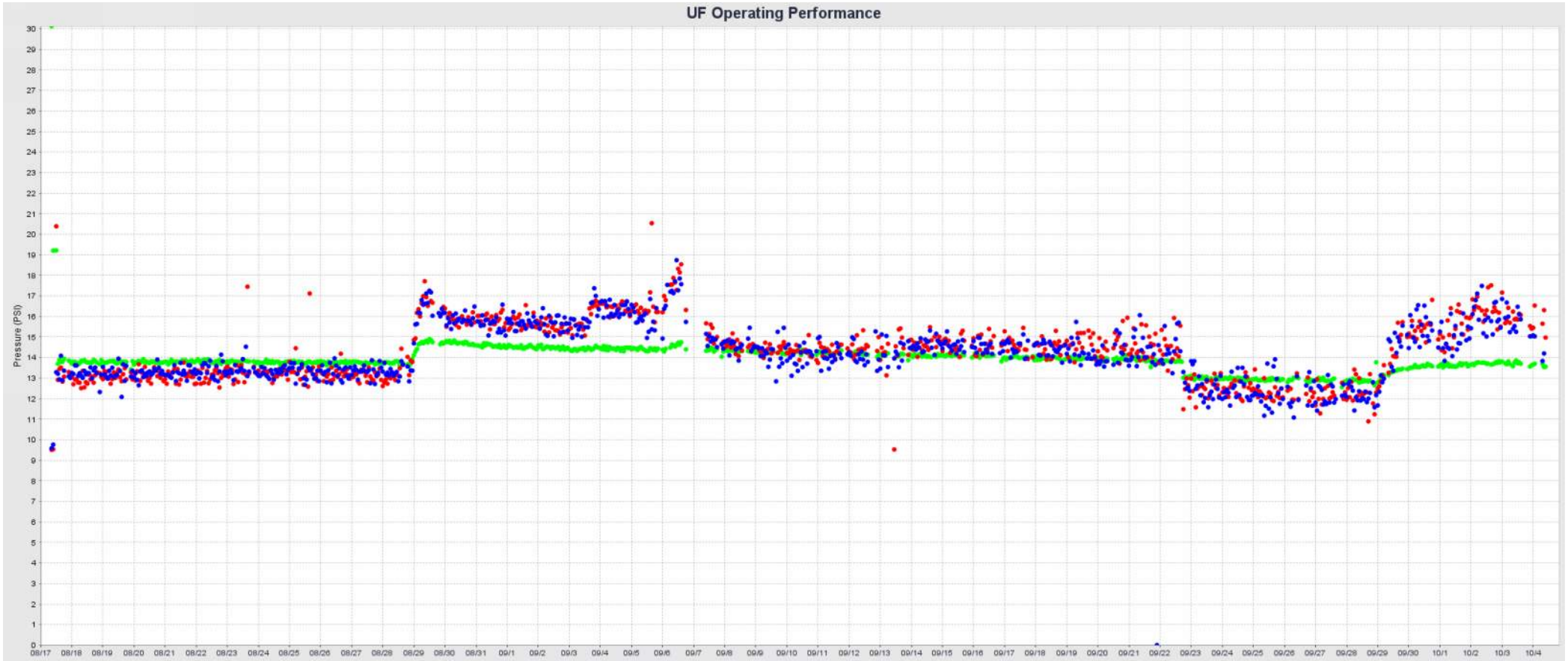



Figure E2 – Transmembrane Pressure (TMP)

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

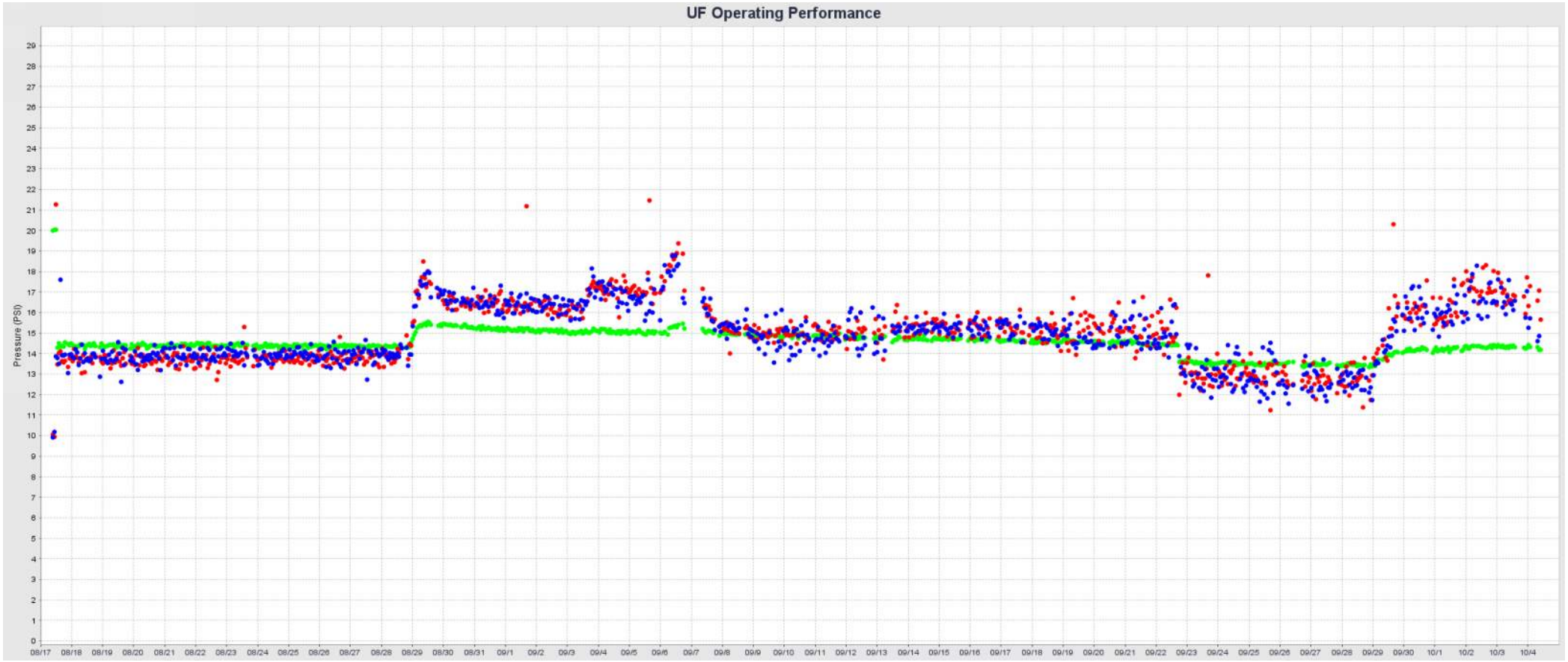



Figure E3 – Transmembrane Pressure (TMP), Temperature Corrected 20 degC

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

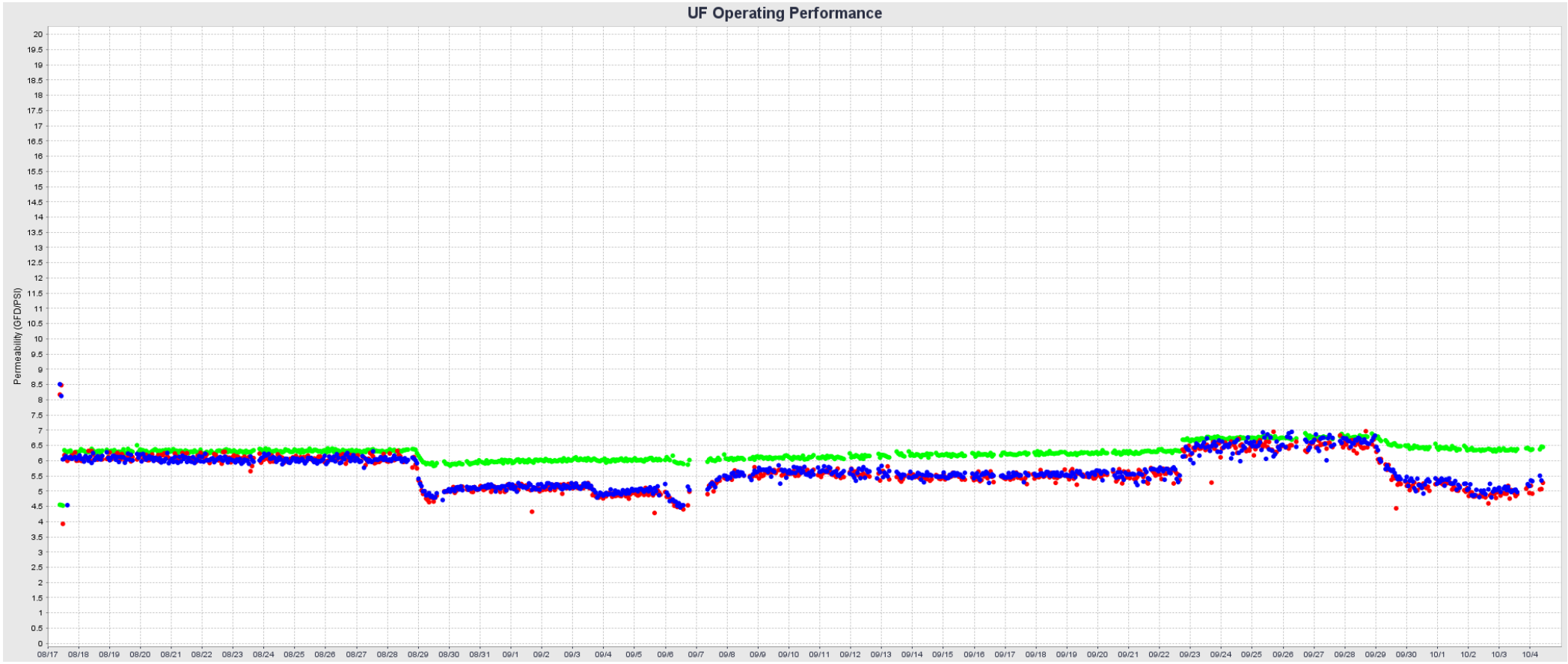



Figure E4 – Permeability

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

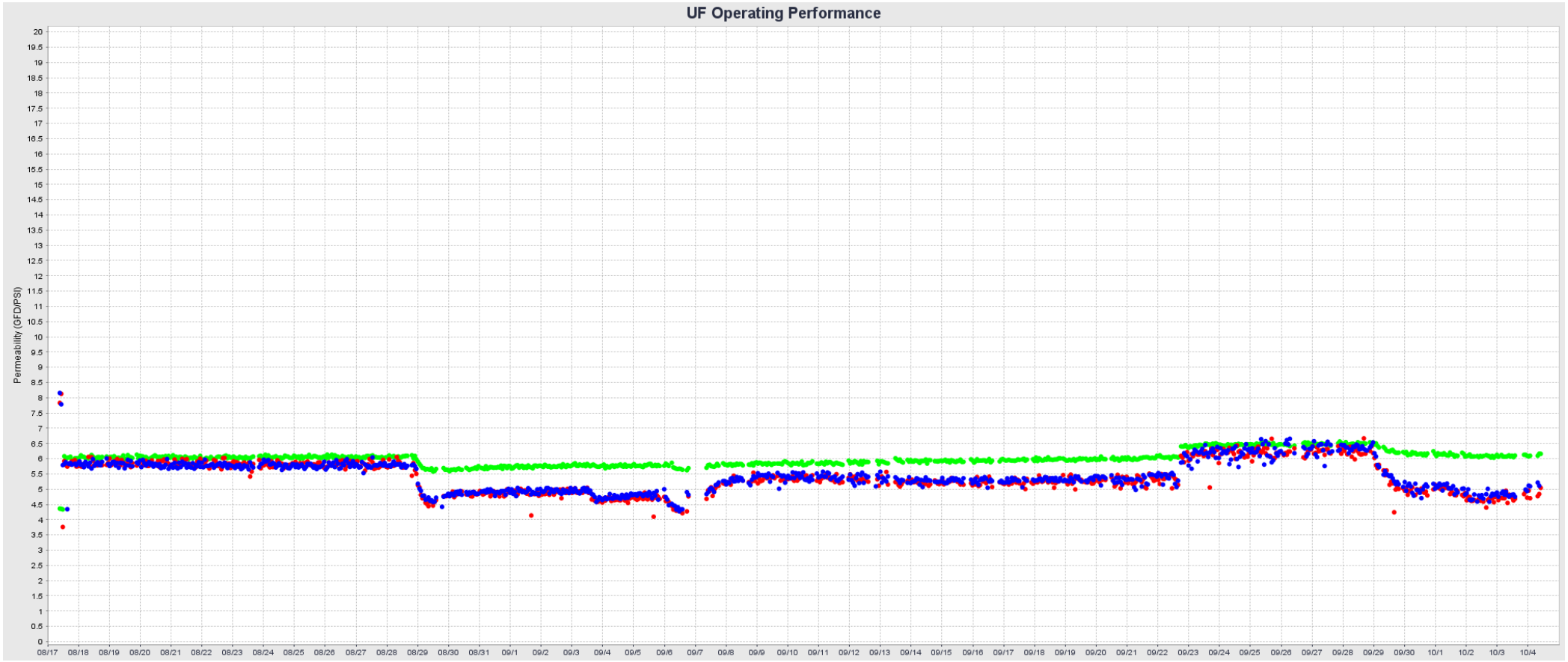



Figure E5 – Permeability, Temperature Corrected 20 degC

(Legend: Green = During Backwash, Blue = After Backwash, Red = Before Backwash)

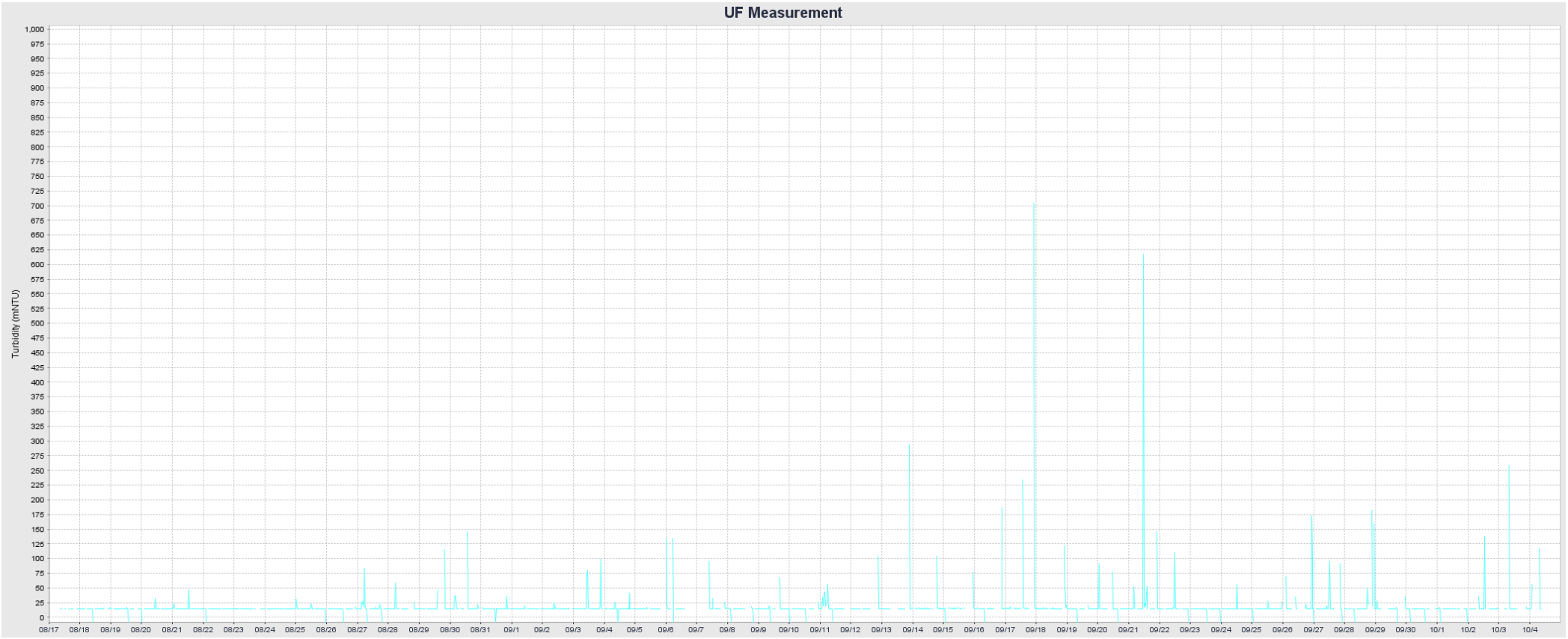



Figure E6 – Filtrate Turbidity

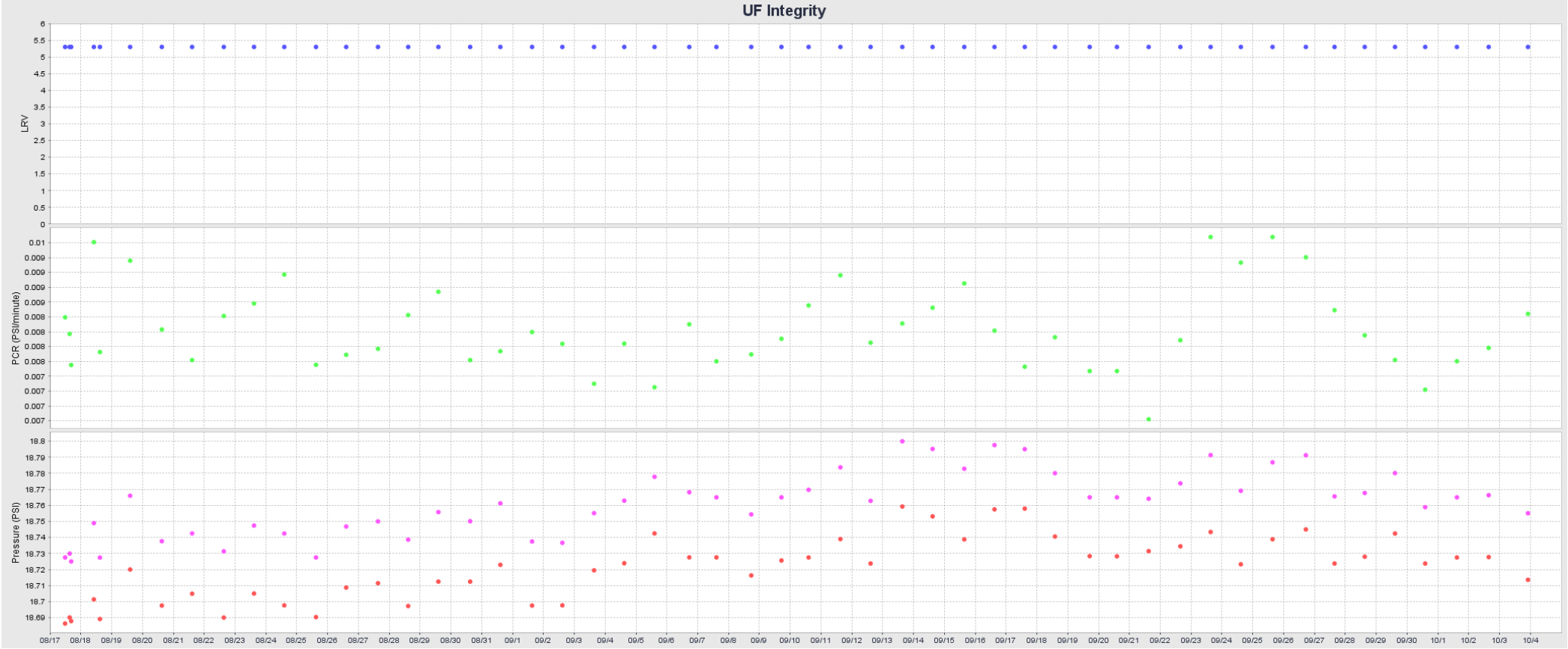



Figure E7 – Membrane Integrity Testing (MIT)

# FEED WATER QUALITY RESULTS

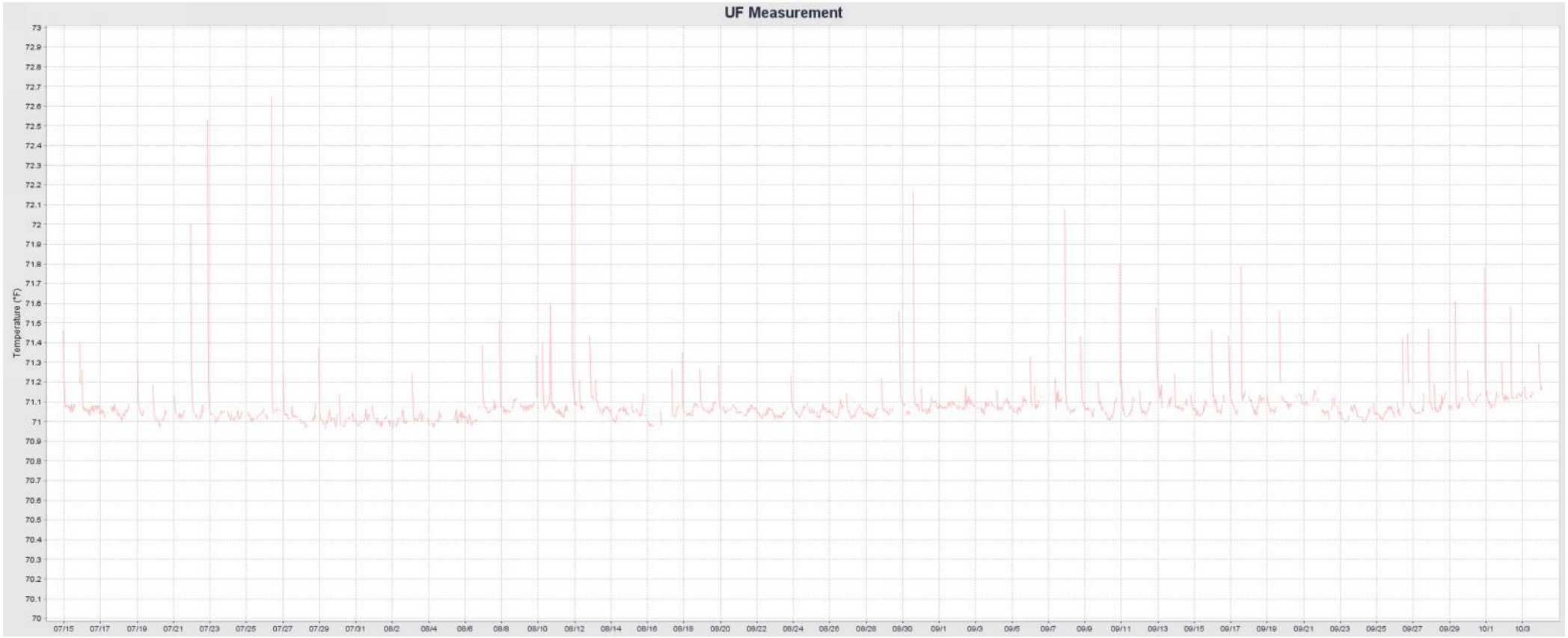



Figure F1 – Feed Water Temperature

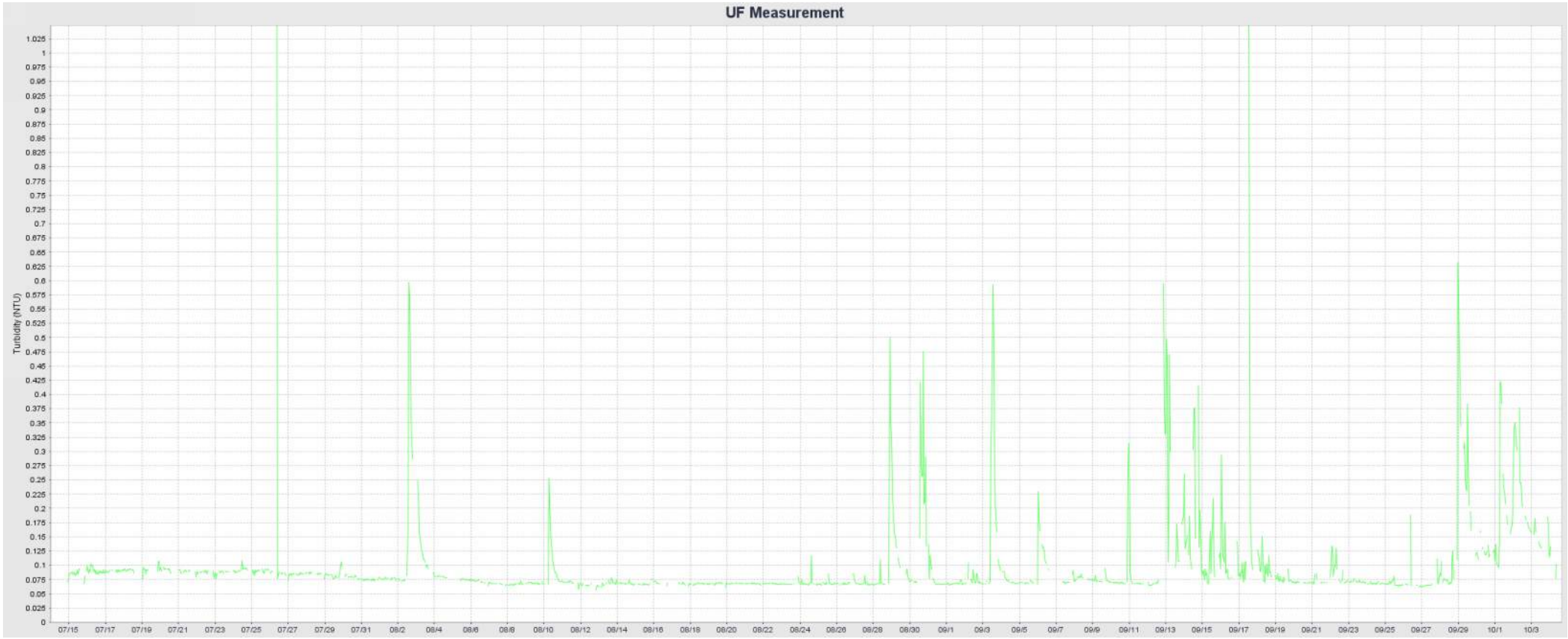



Figure F2 – Feed Water Turbidity

# CHRONOLOGY OF PILOT EVENTS

Pilot Name: City of Georgetown, Southside WTP
Location: Georgetown, Texas

Pilot Equipment: _____

## *Chronology of Pilot Events:*

| Date | Event |
|---|---|
| Jun 16/ 2021 | FiberFlex Pilot System arrives at site |
| Jun 28 - Jul 2/ 2021 | Pilot system commissioning. Discovered leak in DuPont module. |
| Jul 14/ 2021 | DuPont module repaired (pinned) one broken fiber. |
| Jul 14/ 2021 | Phase 1 began |
| Jul 15/ 2021 | Problem reported of UF3 pressure readings. |
| Jul 26/ 2021 | UF3 feed pressure transmitter replaced. |
| Jul 27/ 2021 | MC events peformed on UF1, UF2, and UF3. |
| Aug 4/ 2021 | All three modules set to 80 gfd and held constant going forward. |
| Aug 6/ 2021 | Analogue input card on UF3 changed. |
| Aug 6/ 2021 | Strainer element removed from pilot's Amiad strainer. |
| Aug 16/ 2021 | Replaced 24V power supply, replaced wiring on UF3 feed pressure transmitter |
| Aug 17/ 2021 | Phase 2 began |
| Sep 6/ 2021 | Feed turbidity spikes observed. |
| Sep 6/ 2021 | Power outage caused plant and pilot shutdown. |
| Sep 13/ 2021 | Air compressor down. Replaced blown fuse. |
| Sep 21/ 2021 | Conclusion of the minimum 30-day run (Phase 2) |
| Sep 21-22/ 2021 | CIP events performed on UF1, UF2, and UF3 |
| Sep 22/ 2021 | Phase 3 began |
| Oct 4/ 2021 | Pilot unit shut down and decommissioned |

# FLOW METER CALIBRATION CERTIFICATES

Endress+Hauser
People for Process Automation

# Flow Calibration with Adjustment

30353395-3683178

Pilot inlet flow meter
FIT-11232

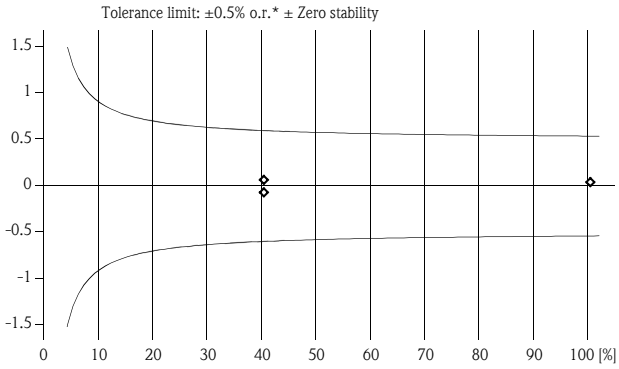
| | |
|---|---|
| 3800174016 | FCP-8.B |
| Purchase order number | Calibration rig |
| US-3005441037-10 / Endress+Hauser Flowtec | 398.3614 us.gal/min ( ≙ 100%) |
| Order N°/Manufacturer | Calibrated full scale |
| 10D80-4LGA1RA0B0AA | Service interface |
| Order code | Calibrated output |
| PROMAG 10 D 3" | 1.2294 |
| Transmitter/Sensor | Calibration factor |
| KA056F16000 | 0 |
| Serial N° | Zero point |
| – | 76.5 °F |
| Tag N° | Water temperature |

| Flow [%] | Flow [us.gal/min] | Duration [s] | V target [us.gal] | V meas. [us.gal] | Δ o.r.* [%] | Outp.** [mA] |
|---|---|---|---|---|---|---|
| 40.2 | 160.043 | 30.1 | 80.186 | 80.239 | 0.07 | 10.43 |
| 40.2 | 160.070 | 30.1 | 80.194 | 80.138 | -0.07 | 10.42 |
| 100.4 | 399.980 | 30.0 | 200.319 | 200.401 | 0.04 | 20.07 |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |

*o.r.: of reading

**Calculated value (4 - 20 mA)

Measured error % o.r.




For detailed data concerning output specifications of the unit under test, see Technical Information (TI), chapter Performance characteristics.

The calibration is traceable to the N.I.S.T. through standards certified at preset intervals.

Endress+Hauser Flowtec operates ISO/IEC 17025 accredited calibration facilities in Reinach (CH), Cernay (FR), Greenwood (USA), Aurangabad (IN) and Suzhou (CN).

10-19-2015
Date of calibration

David McCombs
Operator

Endress+Hauser Flowtec, Division USA
2330 Endress Place
Greenwood, IN 46143

Certified acc. to
ISO 9001, Reg.-N° 030502.2
ISO 14001, Reg.-N° EMS561046

Endress+Hauser

People for Process Automation

Item # 3.

UF1 Feed Flow Meter
FIT-31032-1

# Flow Calibration with Adjustment

30351810-3666156

| | |
|---|---|
| 3800174016 | FCP-8.B |
| Purchase order number | Calibration rig |
| US-3005441037-50 / Endress+Hauser Flowtec | 99.59059 us.gal/min ( ≙ 100%) |
| Order N°/Manufacturer | Calibrated full scale |
| 10P40-ELHA1RA0B0AA | Service interface |
| Order code | Calibrated output |
| PROMAG 10 P 1 1/2" | 0.7631 |
| Transmitter/Sensor | Calibration factor |
| K9084A16000 | 0 |
| Serial N° | Zero point |
| – | 78.2 °F |
| Tag N° | Water temperature |

| Flow [%] | Flow [us.gal/min] | Duration [s] | V target [us.gal] | V meas. [us.gal] | Δ o.r.* [%] | Outp.** [mA] |
|---|---|---|---|---|---|---|
| 39.6 | 39.481 | 60.1 | 39.522 | 39.519 | -0.01 | 10.34 |
| 39.7 | 39.551 | 60.1 | 39.591 | 39.589 | 0.00 | 10.35 |
| 100.3 | 99.921 | 60.1 | 100.019 | 100.046 | 0.03 | 20.06 |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
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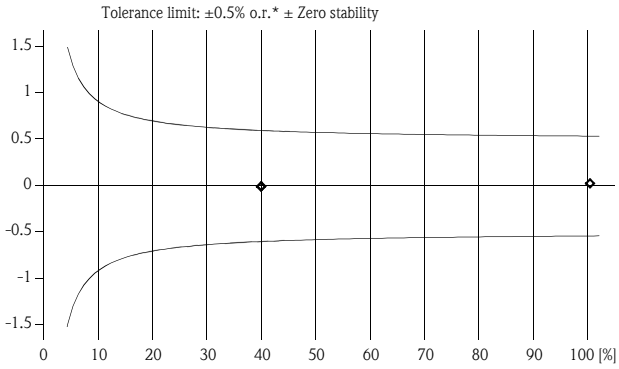
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |

*o.r.: of reading

**Calculated value (4 - 20 mA)

Measured error % o.r.




For detailed data concerning output specifications of the unit under test, see Technical Information (TI), chapter Performance characteristics.

The calibration is traceable to the N.I.S.T. through standards certified at preset intervals.

Endress+Hauser Flowtec operates ISO/IEC 17025 accredited calibration facilities in Reinach (CH), Cernay (FR), Greenwood (USA), Aurangabad (IN) and Suzhou (CN).

09-30-2015

Date of calibration

Travis Burdette

Operator

Endress+Hauser Flowtec, Division USA
2330 Endress Place
Greenwood, IN 46143

Certified acc. to
ISO 9001, Reg.-N° 030502.2
ISO 14001, Reg.-N° EMS561046

Endress+Hauser

People for Process Automation

Item # 3.

UF2 Feed Flow Meter
FIT-31032-2

# Flow Calibration with Adjustment

30351807-3666157

| | |
|---|---|
| 3800174016 | FCP-8.B |
| Purchase order number | Calibration rig |
| US-3005441037-50 / Endress+Hauser Flowtec | 99.59059 us.gal/min ( ≙ 100%) |
| Order N°/Manufacturer | Calibrated full scale |
| 10P40-ELHA1RA0B0AA | Service interface |
| Order code | Calibrated output |
| PROMAG 10 P 1 1/2" | 0.7602 |
| Transmitter/Sensor | Calibration factor |
| K9084B16000 | 0 |
| Serial N° | Zero point |
| – | 78.4 °F |
| Tag N° | Water temperature |

| Flow [%] | Flow [us.gal/min] | Duration [s] | V target [us.gal] | V meas. [us.gal] | Δ o.r.* [%] | Outp.** [mA] |
|---|---|---|---|---|---|---|
| 39.7 | 39.562 | 60.1 | 39.603 | 39.616 | 0.03 | 10.36 |
| 39.7 | 39.564 | 60.1 | 39.604 | 39.596 | -0.02 | 10.35 |
| 100.4 | 99.997 | 60.1 | 100.084 | 100.111 | 0.03 | 20.07 |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
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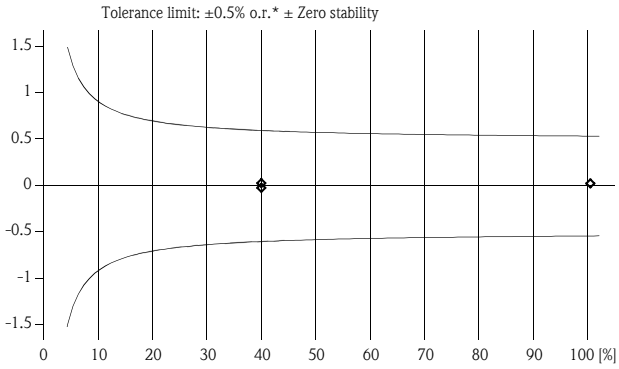
*o.r.: of reading

**Calculated value (4 - 20 mA)

Measured error % o.r.




For detailed data concerning output specifications of the unit under test, see Technical Information (TI), chapter Performance characteristics.

The calibration is traceable to the N.I.S.T. through standards certified at preset intervals.

Endress+Hauser Flowtec operates ISO/IEC 17025 accredited calibration facilities in Reinach (CH), Cernay (FR), Greenwood (USA), Aurangabad (IN) and Suzhou (CN).

09-30-2015

Date of calibration

David McCombs

Operator

Endress+Hauser Flowtec, Division USA
2330 Endress Place
Greenwood, IN 46143

Certified acc. to
ISO 9001, Reg.-N° 030502.2
ISO 14001, Reg.-N° EMS561046

Endress+Hauser

People for Process Automation

Item # 3.

UF3 Feed Flow Meter
FIT-31032-3

# Flow Calibration with Adjustment

30351812-3666158

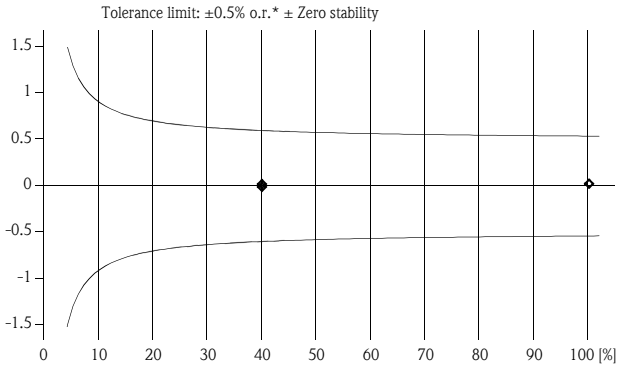
| | |
|---|---|
| 3800174016 | FCP-8.B |
| Purchase order number | Calibration rig |
| US-3005441037-50 / Endress+Hauser Flowtec | 99.59059 us.gal/min ( ≙ 100%) |
| Order N°/Manufacturer | Calibrated full scale |
| 10P40-ELHA1RA0B0AA | Service interface |
| Order code | Calibrated output |
| PROMAG 10 P 1 1/2" | 0.7616 |
| Transmitter/Sensor | Calibration factor |
| K9084C16000 | 0 |
| Serial N° | Zero point |
| – | 78.1 °F |
| Tag N° | Water temperature |

| Flow [%] | Flow [us.gal/min] | Duration [s] | V target [us.gal] | V meas. [us.gal] | Δ o.r.* [%] | Outp.** [mA] |
|---|---|---|---|---|---|---|
| 39.8 | 39.661 | 60.1 | 39.702 | 39.711 | 0.02 | 10.37 |
| 39.8 | 39.658 | 60.1 | 39.701 | 39.698 | -0.01 | 10.37 |
| 100.2 | 99.754 | 60.1 | 99.858 | 99.882 | 0.02 | 20.03 |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |

*o.r.: of reading

**Calculated value (4 - 20 mA)

Measured error % o.r.




For detailed data concerning output specifications of the unit under test, see Technical Information (TI), chapter Performance characteristics.

The calibration is traceable to the N.I.S.T. through standards certified at preset intervals.

Endress+Hauser Flowtec operates ISO/IEC 17025 accredited calibration facilities in Reinach (CH), Cernay (FR), Greenwood (USA), Aurangabad (IN) and Suzhou (CN).

09-30-2015

Date of calibration

Travis Burdette

Operator

Endress+Hauser Flowtec, Division USA
2330 Endress Place
Greenwood, IN 46143

Certified acc. to
ISO 9001, Reg.-N° 030502.2
ISO 14001, Reg.-N° EMS561046

Endress+Hauser

People for Process Automation

# Flow Calibration with Adjustment

Backpulse flow meter
FIT-36074

30351992-3667116

| | |
|---|---|
| 3800174016 | FCP-6.C |
| Purchase order number | Calibration rig |
| US-3005441037-90 / Endress+Hauser Flowtec | 155.6102 us.gal/min ( ≙ 100%) |
| Order N°/Manufacturer | Calibrated full scale |
| 10D50-4LGA1RA0B0AA | Service interface |
| Order code | Calibrated output |
| PROMAG 10 D 2" | 1.3509 |
| Transmitter/Sensor | Calibration factor |
| K908DB16000 | 0 |
| Serial N° | Zero point |
| – | 75.7 °F |
| Tag N° | Water temperature |

| Flow [%] | Flow [us.gal/min] | Duration [s] | V target [us.gal] | V meas. [us.gal] | Δ o.r.* [%] | Outp.** [mA] |
|---|---|---|---|---|---|---|
| 39.3 | 61.212 | 30.1 | 30.733 | 30.743 | 0.03 | 10.30 |
| 39.4 | 61.274 | 30.1 | 30.770 | 30.760 | -0.03 | 10.30 |
| 99.9 | 155.507 | 30.1 | 78.131 | 77.918 | -0.27 | 19.95 |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |
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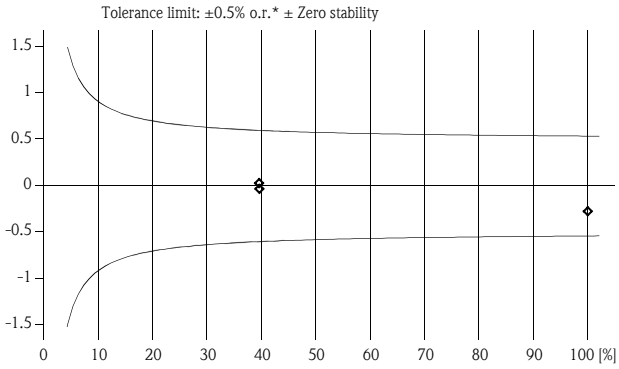
| – | – | – | – | – | – | – |
| – | – | – | – | – | – | – |

*o.r.: of reading

**Calculated value (4 - 20 mA)

Measured error % o.r.




For detailed data concerning output specifications of the unit under test, see Technical Information (TI), chapter Performance characteristics.

The calibration is traceable to the N.I.S.T. through standards certified at preset intervals.

Endress+Hauser Flowtec operates ISO/IEC 17025 accredited calibration facilities in Reinach (CH), Cernay (FR), Greenwood (USA), Aurangabad (IN) and Suzhou (CN).

10-02-2015

Date of calibration

Travis Burdette

Operator

Endress+Hauser Flowtec, Division USA
2330 Endress Place
Greenwood, IN 46143

Certified acc. to
ISO 9001, Reg.-N° 030502.2
ISO 14001, Reg.-N° EMS561046

# APPENDIX J

# Membrane Module Information

# (Envelope 1)

Product Datasheet

TORAY
Innovation by Chemistry

# HFUG-2020AN

## Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

The HFUG-2020AN module is Toray's latest UF innovation that features hollow fibers with a smaller diameter but with improved membrane durability and performance. The result is an increased surface area per module for more production output.

| Membrane Characteristics | | Unit | Value |
|---|---|---|---|
| Membrane Material | | | PVDF (Polyvinylidene fluoride) |
| Nominal Pore Size | | µm | 0.01 |
| Outer Membrane Surface Area | | $m^2$ ($ft^2$) | 90 (969) |
| **Operating Parameters** | | **Unit** | **Value** |
| Maximum Feed water / Filtrate Flow | | $m^3/h$ (gpm) | 15 (66) |
| Maximum Backwash Flow | | $m^3/h$ (gpm) | 16.8 (74) |
| Maximum Air Flow | | $Nm^3/h$ (scfm) | 9.0 (5.3) |
| Maximum Inlet Pressure | | kPa (psi) | 300 (43.5) |
| Maximum Backwash Pressure | | kPa (psi) | 300 (43.5) |
| Normal Operating Trans-membrane Pressure | | kPa (psi) | 0–200 (0–29) |
| Operating Temperature Range | | °C (°F) | 1–40 (34–104) |
| pH Range | During Filtration | | 1–10 |
| | During Cleaning | | 0–12 |

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

### Product Certifications & Compliances

(Please contact Toray for details on the certified modules)

- NSF/ANSI/CAN 61 for drinking water applications
- NSF/ANSI 419 to comply with the U.S. EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), which allows membrane manufacturers to prove Cryptosporidium reduction
- Association of Membrane Separation Technology of Japan
- Korea Water and Wastewater Works Association

### Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Secondary and Tertiary wastewater

Product Datasheet

TORAY
Innovation by Chemistry

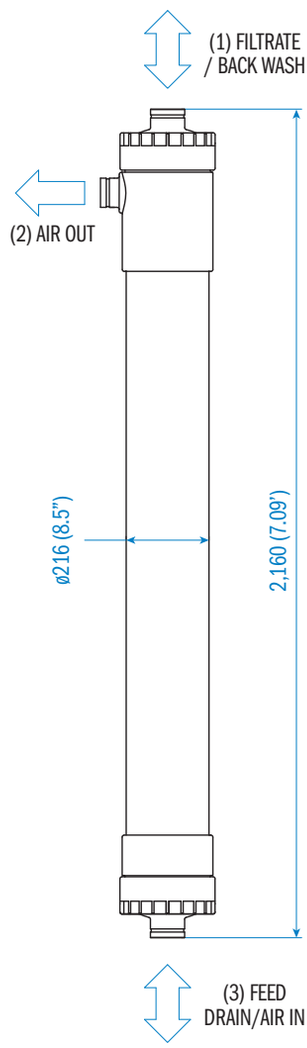
# HFUG-2020AN

## Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

| Dimensions and Weight | | Unit | Value |
|---|---|---|---|
| Diameter | | mm (in) | 216 (8.5) |
| Length | | mm (ft) | 2,160 (7.087) |
| Weight | Full of Water | kg (lbs) | 92 (203) |
| | After Draining | kg (lbs) | 49 (108) |

| Connections | Value |
|---|---|
| (1) Filtrate / Backwash | Housing type joint, 80A |
| (2) Air Out | Housing type joint, 65A |
| (3) Feed Drain / Air In | Housing type joint, 80A |

| Material Composition | |
|---|---|
| Casing | uPVC |
| Cap | uPVC |
| Potting | Epoxy resin |
| O-ring | EPDM |




Please contact Toray for more detailed drawing and dimensions.



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LinkedIn YouTube

For more info, please visit
water.toray

NSF International
789 N. Dixboro Rd. Ann Arbor, MI 48015, USA
1-800.NSF.MARK | +1-734.769.8010 | www.nsf.org

# TEST REPORT

**Send To: 53110**
Mr. Yosei Fujita
Toray Industries, Inc.
1-1-2, Nihonbashi-Muromachi
Chuo-ku, Tokyo
103-8666
Japan

**Facility: C53111**
Toray Chemical Korea, Inc.
300, 3gongdan 2-ro, Gumi
Gyeongsangbuk-do 730350
Korea, Republic of

**Result:** **PASS** Report Date: 15-AUG-2019

| | |
|---|---|
| Customer Name: | Toray Industries, Inc. |
| Tested To: | NSF/ANSI Standard 419-2018: Public Drinking Water Equipment Performance – Filtration |
| Location of Testing: | NSF International, 789 N. Dixboro Rd., Ann Arbor, MI 48105 |
| Description: | Ultrafiltration Membrane Modules, Model Number HFUG-2020AN |
| Test Type: | Qualification |
| Job Number: | J-00320592 |
| Project Number: | W0526739 |
| Project Manager: | Sangho Lee |

**Thank you for having your product tested by NSF International.**

Please contact your Project Manager if you have any questions or concerns pertaining to this report.

**Report Authorization:** _____
Kevin Schaefer – Group Leader, Engineering Laboratory

**Authority:** _____
Paul Anderson – Director, Engineering Laboratory

**This report replaces the report with serial number FI20190718103612. It is being reissued to update sample volume specifications. This does not change the overall status of the report.**

# Table of Contents

**Tables, Figures and Equations**

## Executive Summary

The Toray HFUG-2020AN modules are Pressurized PVDF Hollow Fiber ultrafiltration membrane modules. The specifications and operating parameters are listed in Table 1, and the flow path was outside to inside and testing was performed in deposition mode (no cross flow).

**Table 1 – Challenge Test Summary Results**

| | |
|---|---|
| Membrane manufacturer | Toray Industries, Inc. |
| Membrane model number | HFUG-2020AN |
| Membrane type | Hollow fiber |
| Membrane classification | Ultrafiltration |
| Challenge test date | 04/01/2019 – 6/27/2019 |
| Challenge particle or organism | MS2 and *Bacillus atrophaeus* |
| $LRV_{C\text{-}Test}$ (log) | 5.17 |
| Challenge test feed water temperature (°C) | 16.11 – 21.94 |
| Challenge test flux (gfd) | 120.14 - 120.57 |
| Challenge test flux normalized to 20°C (gfd)[1] | 113.78- 132.79 |
| Challenge test TMP (psi) | 15.19– 18.29 |
| Revised Non-Destructive Performance Test (NDPT) Method | Pressure decay test from 18.85 psi |
| Revised Quality Control Release Value (QCRV) | 0.048 psi/min |
| Equation for Air-Liquid Conversion Ratio (ALCR) | $ALCR_{Turbulent} = 170 \times Y \times \sqrt{\frac{(P_{test} - BP)(P_{test} + P_{atm})}{((460 + T) \times TMP)}}$ |
| Equation for $LRV_{DIT}$ | $LRV_{DIT} = \log_{10}\left[\frac{Q_P \times ALCR \times P_{atm}}{\Delta P_{test} \times V_{sys} \times VCF}\right]$ |

[1]*Test flux normalized to 20°C using equation 2.10 from the Membrane Filtration Guidance Manual, USEPA 2005*

The Toray HFUG-2020AN modules were challenge tested using *Bacillus atrophaeus* endospores as a surrogate for *Cryptosporidium* oocyst removal efficiency. From modules possessing a pressure decay test (PDT) decay rate within the revised QCRV of 0.048 psi/min, which included challenge tests on five intact modules and one module compromised with a poked hole in one fiber, the Log Removal Value of the challenge test ($LRV_{C\text{-}Test}$) was 5.17 $\log_{10}$ and the mean log removal observed between all measurements was 6.01 $\log_{10}$. Additionally, two modules were subjected to a challenge test using *Bacillus atrophaeus* endospores after having been compromised with a single cut fiber. As these modules exhibited a pressure decay rate well beyond that of the manufacturer's expected QCRV, the results from this challenge test were not given consideration for selection of a revised factory QVRV and are included for informational purposes only.

Toray uses a pressure decay test (PDT) as their manufacturing non-destructive performance test (NDPT) for the HFUG-2020AN modules. NSF certification requires the manufacturer to reset the manufacturing quality control release value (QCRV) to match the NDPT result measured by NSF that correlates with the observed $LRV_{C\text{-}Test}$. A robust correlation was not developed between PDT results and the $LRV_{C\text{-}TEST}$. As such, any module possessing a pressure decay rate within the range of rates observed during testing, 0.048 psi/min or lower, could be expected to achieve similar log removal values. As a result, NSF has set the NDPT QCRV from the module with the highest average pressure decay rate, 0.048 psi/min from a starting pressure of 18.85 psi, for production units that are NSF certified for performance.

Toray also requested challenge testing using coliphage virus MS2 as a viral surrogate on two intact modules and two compromised modules. The log reduction values observed during these tests ranged from 1.29 to 1.90 $\log_{10}$ for the intact modules and ranged from 1.05 to 1.86 $\log_{10}$ for the compromised modules. As certification to NSF/ANSI 419 is based on using *Bacillus atrophaeus* endospores as a surrogate for *Cryptosporidium* oocyst removal efficiency, the results of the MS2 challenge tests are included for informational purposes only.

# Introduction

### Description of Testing Organization

NSF International (NSF) is an independent third-party testing and certification organization accredited to ISO/IEC 17065, which applies to the requirements for bodies operating product certification systems, and ISO/IEC 17025, which contains the general requirements for the competence of testing and calibration facilities and organizations.

NSF / ANSI Standard 419 was approved through ballot of the Public Drinking Water Equipment Performance (PDWEP) Joint Committee. NSF / ANSI Standard 419 (NSF 419) was developed to serve drinking water stakeholders in the implementation of several US Environmental Protection Agency (EPA) rules to reduce the risk of exposure to water-borne pathogens in drinking water. Products certified to NSF 419 have met the performance testing and non-testing requirements described in NSF 419 and NSF Certification General and Program Specific Policies. The non-testing requirements include an annual audit of the production location. This audit monitors for any unauthorized design or material changes to the products and monitors the manufacturer's internal quality control testing. NSF certification for performance requires the manufacturer to reset the manufacturing non-destructive performance test (NDPT) quality control release value (QCRV) to match the NDPT result measured by NSF that correlates with the observed Log Removal Value of the challenge testing ($LRV_{C\text{-}Test}$).

### Test Site

Testing of the Toray HFUG-2020AN modules was conducted in the NSF testing laboratory in Ann Arbor, Michigan.

### Description of Membrane Filtration Product

The Toray HFUG-2020AN modules are pressure-driven ultrafiltration membrane modules, the flow path is outside to inside, and testing was performed in deposition mode (no cross flow).

The serial numbers of the modules submitted for testing are provided in Table 2. The module number designations are used in the Results and Discussion section to identify the modules.

**Table 2 - Module Serial Numbers**

| Module Number | Serial Number |
|---|---|
| 1 | F418050217 |
| 2 | F418060016 |
| 3 | F418050182 |
| 4 | F418050261 |
| 5 | F418050282 |

### Testing Objectives

Testing followed the procedures described in this test report that was specifically written for the Toray HFUG-2020AN modules for the purpose of NSF Certification. Five modules of the Toray HFUG-2020AN were submitted by the manufacturer for testing.

Testing of the Toray HFUG-2020AN modules was conducted in the NSF testing laboratory using *Bacillus* endospores as a surrogate for *Cryptosporidium* to achieve a target LRV of 6.0 or greater. All tests followed the product-specific challenge test requirements of NSF 419. NSF 419 was based on the Environmental Technology Verification (ETV) *Generic Protocol for the Product Specific Challenge Testing of Microfiltration or Ultrafiltration Membrane Modules* (May 2011) and the product-specific challenge testing requirements in the USEPA Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) (40 CFR §141.719) as described in EPA *Membrane Filtration Guidance Manual* (MFGM). NSF Certification Program Specific policies are based on the non-test requirements described in LT2ESWTR (40 CFR §141.719). NSF certification of performance is only based on reduction of *Cryptosporidium* as linked to the QCRV.

## Membrane Description

A summary of the Toray HFUG-2020AN modules is shown below in Table 3.

**Table 3 - Manufacturer and Model Specifications**

| Description | |
|---|---|
| Membrane Make | Toray |
| Membrane Model Number | HFUG-2020AN |
| ANSI/NSF Standard 61 certification | Certified |
| Membrane type | Hollow Fiber |
| Membrane classification | Ultrafiltration |
| Nominal & max pore size, or molecular weight cutoff rating | 150,000 daltons |
| Membrane media symmetry | - |
| Membrane material | PVDF |
| Feed side membrane filtration area ($ft^2$) | 969 |
| **Membrane module specifications** | |
| Module outside diameter (mm) | 216 |
| Length (mm) | 2,160 |
| Module volume (gallons and liters) | Feed side, lumen, end caps: 45.0 Liters, 11.88 gallons |
| Potting depth (mm) | - |
| Potting material | Epoxy and/or equivalent |
| Module weight – full/dry (kg) | 110 / 67 |
| Module casing material – if pressurized | PVC and/or equivalent |
| **Membrane fiber characteristics** | |
| Number of fibers per module | 14,000 |
| Inside fiber diameter (mm) | 0.7 |
| Fiber wall thickness (mm) | 0.2 |
| Active fiber length (mm) | 1,816 |
| Filtration Flow Direction (i.e., inside-out or outside-in) | Outside – In |
| Hydraulic configuration (i.e., deposition or suspension) | Dead End |
| **Operating Limits** | |
| Maximum design filtrate flux at 20°C (gfd) | 120 |
| Maximum inlet module pressure (psi) | 43.5 |
| Maximum design transmembrane pressure (TMP) at 20°C | 43.5 psi max, 29.0 psi normal operation |
| Maximum TMP at any temperature | 29 psi |
| Max oxidant tolerance (cleaning; oxidant(s)) | 3000 mg/L $Cl_2$ |
| Max oxidant tolerance (normal operation; oxidant(s)) | - |
| pH tolerance range (cleaning) | 0.0 – 12.0 (0.0-40°C) |
| pH tolerance range (normal operation) | 1.0 – 10.0 (0.0 – 40°C) |
| Temperature tolerance range | 0.0 – 40°C |

**Module Integrity Test Description**

Toray uses a pressure decay test to evaluate the integrity of the HFUG-2020AN modules

Immediately before and after each challenge test, each module underwent a pressure decay test following a procedure specified by the manufacturer to demonstrate continued membrane integrity in the field (18.85 psi / 10 minutes). To conduct the pressure decay test, the following procedure was used:

1. The outside of the membrane is filled with water.
2. Close valves except filtrate port.
3. Apply 18.85 psi of air pressure to the side port
4. Close the air inlet valve to the side port
5. Allow pressure to stabilize for 5 minutes
6. Apply 18.85 psi of air pressure to the side port with opening the air inlet valve
7. Close the air inlet valve to the side port
8. Record the change in feed port air pressure for 10 minutes
9. The decay value for 10 minutes should be less than 0.26 psi

This same pressure decay test procedure was also applied to the pressurized sections of the test rig plumbing to ensure that any pressure loss from the plumbing was negligible.

# Methods and Procedures

### Test Apparatus

The modules were tested in a system constructed specifically for these tests. The test system construction conformed to the requirements of the MFGM. See Figure 1 for a schematic diagram of the test system, Figure 2 for a photograph of the test system, Figure 3 for a photograph of the module, and Table 4 for specifications of the test apparatus.

**Figure 1 - Schematic Diagram of Test System**

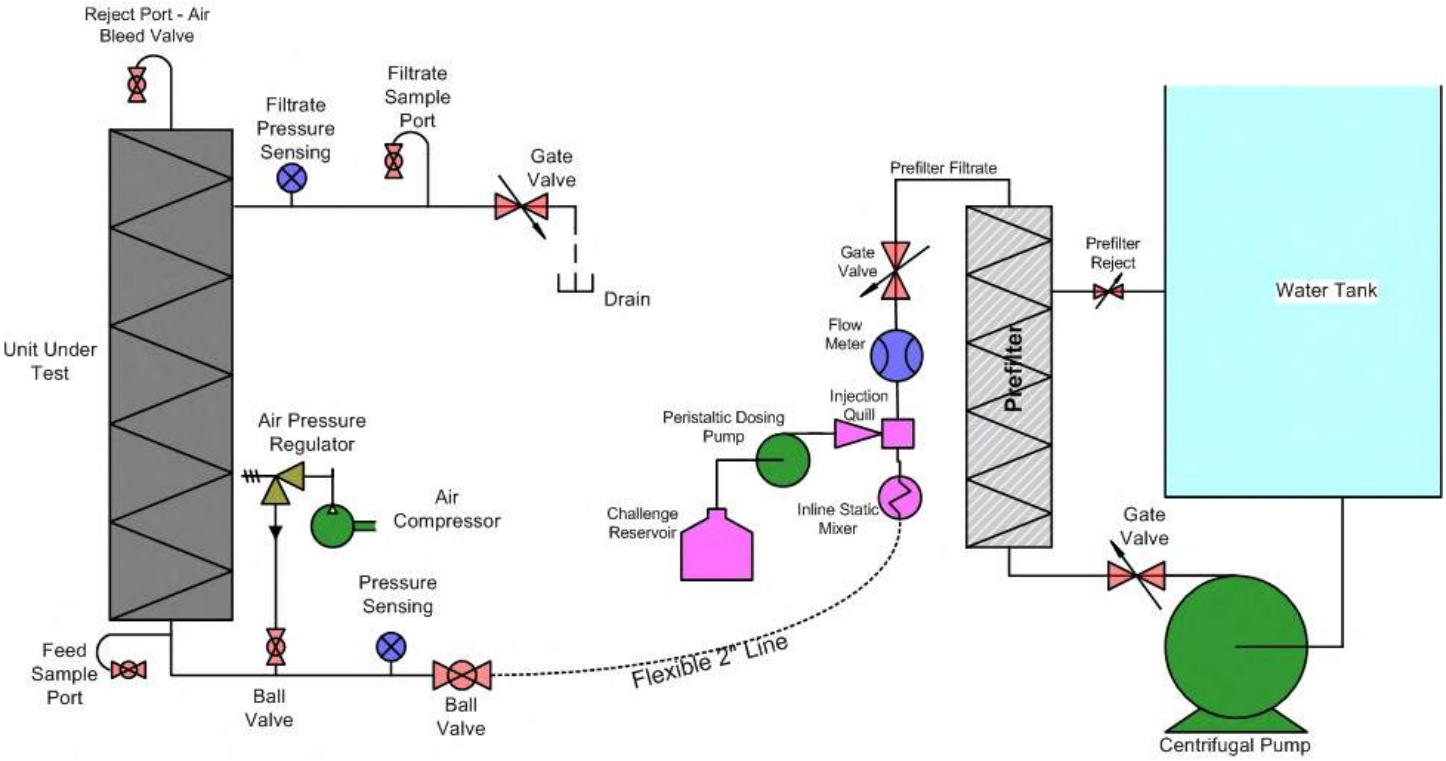
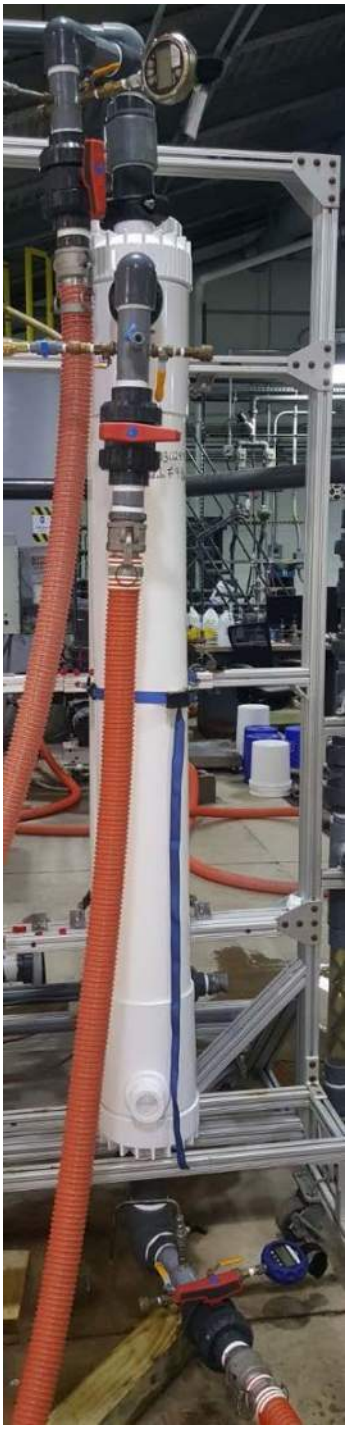


Figure 2 - Test Setup

Figure 3 - Test Sample



## Table 4 - Test Apparatus Specifications

| | |
|---|---|
| Test Skid | |
| Skid manufacturer | Custom (NSF) |
| Skid model number | n/a |
| Vsys of skid piping (gallons) | App. 3.66 |
| Vsys of skid piping (liters) | App. 13.85 |
| Maximum back pressure (psi) during direct integrity testing | 2.98 psi |
| Hydraulic configuration (deposition or cross-flow) | Deposition |
| Flow direction (inside-out or outside-in) | Outside - In |
| Flow Meter | |
| Location (feed side, filtrate side, etc.) | Feed |
| Meter make | *May be provided upon request* |
| Meter model number | *May be provided upon request* |
| Range (gpm) | 0-250 |
| Resolution (gpm) | 0.1 |
| Accuracy (%) | ≤2% of reading |
| Repeatability/precision (%) | n/a |
| Transducer linearity (%) | n/a |
| Feed side pressure sensor | |
| Purpose (TMP, PDR, etc.) | TMP, PDR |
| Sensor make | *May be provided upon request* |
| Sensor model number | *May be provided upon request* |
| Range (psi) | Vacuum – 30 psi |
| Resolution (psi) | 0.001 |
| Accuracy (%) | ASME B40.1 3A or better |
| Repeatability/precision (%) | ASME B40.1 3A or better |
| Transducer linearity (%) | ASME B40.1 3A or better |
| Filtrate side pressure sensor | |
| Purpose (TMP, PDR, etc.) | TMP, PDR |
| Sensor make | *May be provided upon request* |
| Sensor model number | *May be provided upon request* |
| Range (psi) | Vacuum – 30 psi |
| Resolution (psi) | 0.001 |
| Accuracy (%) | ASME B40.1 3A or better |
| Repeatability/precision (%) | ASME B40.1 3A or better |
| Transducer linearity (%) | ASME B40.1 3A or better |

### Challenge Particulates

### Microbial Challenge Test Procedure

Each of the modules was tested individually, and for those modules that were used for both MS2 and *Bacillus atrophaeus* challenge tests, the MS2 was challenge test was performed first, followed by the *Bacillus atrophaeus* endospore challenge test.

#### *Cryptosporidium* Surrogate

The modules were tested for removal of *Cryptosporidium* using endospores of the bacteria *Bacillus atrophaeus* American Type Culture Collection (ATCC) number 9372, deposited as *Bacillus subtilis* var. *niger*. *B. atrophaeus* was selected as the surrogate because it is a non-pathogenic bacterium, and because of the high cost of suitable titers of live *Cryptosporidium* for testing at higher flow rates. The strain of *B. atrophaeus* used for testing yields orange colonies with a distinctive morphology on trypicase soy agar (TSA), so it can be distinguished from wild-type endospores that could be present as contamination. *B. atrophaeus* endospores are ellipsoidal (football shaped), with an average diameter of 0.8 µm, and an average length of 1.8 µm. See Appendix D of NSF/ANSI 419 for further discussion regarding the use of *Bacillus* endospores as a surrogate for *Cryptosporidium* and *Giardia*.

The LT2ESWTR calls for the maximum challenge concentration to be 6.5 $\log_{10}$ above the organism's detection limit, which for the endospores was 1 CFU/100 mL. The goal for the *B. atrophaeus* challenges was to be able to measure the highest feasible log reductions. So, NSF selected a target of 6.26 $\log_{10}$ ($1.8 \times 10^6$ CFU/100 mL) in order to account for less than 100% recovery of the spiked challenge organism concentration and variability associated with counting of microorganisms.

#### Viral Surrogate

NSF used the coliphage virus MS2 (ATCC 15597-Bl) as the surrogate for pathogenic viruses. MS2 is generally accepted as a pathogenic virus surrogate for size-exclusion technologies due to its small size, at 22 to 26 nanometers in diameter. The MFGM references MS2 as an acceptable surrogate for pathogenic viruses because it is similar in size and shape to poliovirus and the hepatitis virus. The target MS2 challenge concentration target was 6.26 $\log_{10}$ ($1.8 \times 10^6$ PFU/mL).

### System Operating Conditions

#### Test Water Composition

The test water was City of Ann Arbor, Michigan tap water treated by activated carbon filtration to remove the disinfectant residual, and ultrafiltration to reduce suspended particles. The UF pre-filtration step was downstream of the test water storage tank, as indicated in Figure 1, to remove suspended particles immediately prior to the test unit. Immediately prior to each challenge test, grab samples were collected from the feed tap for analysis of total chlorine, alkalinity, pH, temperature, total dissolved solids, total organic carbon, iron, manganese, and turbidity.

#### UF Module Conditioning

Prior to testing, all modules were sanitized and conditioned in accordance with the manufacturer's instructions. The modules were brand new when tested and had not been operated prior to testing other than to conduct the conditioning procedure. The procedure is detailed below.

1. Drain preservative
2. Filtration mode @ 6.6 gpm for 30 minutes or more
3. Filtration mode @ 13.2 gpm for 120 minutes with 3,000 mg/L free chlorine
4. Rinse w/chlorine free water @ 13.2 gpm until no residual in effluent

### Test System Sanitization

The UF module conditioning procedure also served to sanitize the test system. The test system plumbing was also sanitized in between testing each module by injecting a bleach solution into the feed stream to provide an appropriate CT for sanitization.

After each sanitization period, the plumbing was flushed with de-chlorinated tap water until no chlorine was detected in grab samples collected from the filtrate sample tap.

### Challenge Test Solution Design and Seeding Method

The challenge organism challenge suspension was introduced into the feed water by intermittent injection during the challenge tests. Injection and mixing of the suspension into the feed stream followed the guidelines of the MFGM and NSF 419. Specifically, the total stock solution volume injected into the feed stream during each challenge test was between 0.5 and 2 percent of the total test solution volume, a chemical metering pump that delivered a steady flow of the challenge solution was used, and the injection port included a quill extending into the middle of the feed pipe. Also following the requirements of the MFGM, the feed sampling tap was located at least ten pipe diameters downstream of the injection point, and a static mixer was installed between the injection and feed sampling ports.

### Membrane Compromising Method

The membrane used for the ‘poked hole’ test was compromised by using a micro needle to create a hole in a single fiber element. If the pressure decay rate was not found to be above the manufacturer’s stated QCRV, additional holes were created as necessary. The location of the poked hole(s) was near the top of the module, to create a short flow path for challenge particulates to reach the effluent side of the filter. The micro needle is shown below in Figure 4.

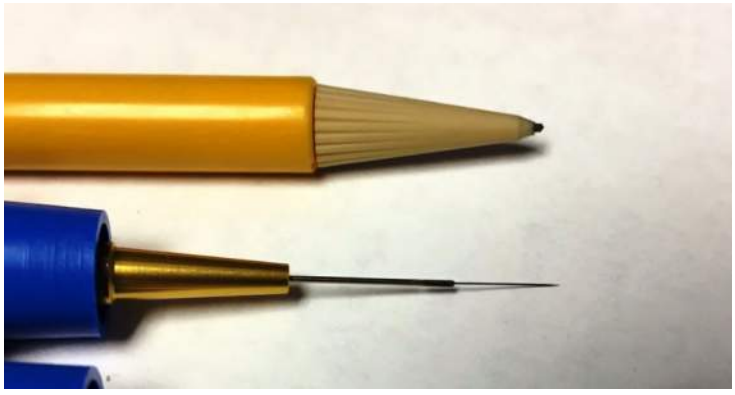


**Figure 4 - Micro Needle**

The membrane used for the ‘cut fiber’ test was compromised by using a scalpel to cut a single fiber element. The location of the cut was near the top of the module to create a short flow path for challenge particulates to reach the effluent side of the filter.

**Process Monitoring and Sampling Plan**

The feed and filtrate samples were collected as grab samples from taps with quills extending into the middle of the pipe. The taps were metal, so they were able to be flame-sterilized prior to sample collection. Prior to performing challenge testing, the pressure decay rate was measured for the portions of the test apparatus subjected to air pressure during the NDPT of the test modules. This "background decay rate" test was performed to allow for corrections to be made to the observed pressure decay rates of the test modules to account for any air leaks associated with the test apparatus.

Each of the modules was tested individually, and the target flux for membrane operation was 120 gfd, which equals a flow rate of 80.75 gpm for the Toray HFUG-2020AN module. Immediately prior to testing, each module was backwashed for at least one minute at a minimum flow rate of 80.75 gpm, then forward flushed for at least five minutes at a minimum flow of 80.75 gpm.

Total chlorine was also measured in the feed water immediately prior to each challenge test to confirm the water was free of chlorine.

Following the forward flush, the pre-challenge membrane integrity test was conducted. After the integrity test, the test water feed (minus challenge organism injection) was resumed at a minimum flow of 80.75 gpm, and the module was forward flushed for an additional five minutes to remove the air in the module from the pressure decay test. At the end of this second forward flush, two feed and two filtrate samples were collected. One sample of each process stream served as a negative control and was enumerated for the challenge organism. The second sample pair was spiked with the challenge organism to serve as a positive control.

The flow rate was adjusted, if necessary, to at least 80.75 gpm for the microbial challenge test and was maintained as close as possible to 80.75 gpm without going below it. Each challenge test was approximately 5 minutes in length. The challenge organism suspension was injected into the feed stream continuously during operation. The suspension was constantly stirred using a magnetic stir bar. Sections 3.10.2, 3.10.4, and 3.12.4 of the MFGM describe the requirements for the challenge test sampling plan.

The MFGM requires that feed and filtrate samples not be collected until at least three hold-up volumes of water spiked with the challenge organism have passed through the membrane, to allow for establishment of equilibrium (equilibrium volume). The hold-up volume is defined as the "unfiltered test solution volume that would remain in the system on the feed side of the membrane at the end of the test". The manufacturer provided the hold-up volume of the test sample, which was 34.0 liters (8.98 gallons). Feed and filtrate samples were always collected after a minimum of two minutes or more of flow containing the challenge organism had passed through the test sample (>161.5 gallons) to assure that the three-times the holdup volume condition was met.

After the minimum required injection time, a grab sample was first collected from the filtrate sample tap, and then from the feed sample tap. The sample taps were flame sterilized prior to sample collection, and at least 100 mL was discarded prior to sample collection to flush the taps. The samples were collected directly into autoclaved Nalgene containers provided by the Microbiology Laboratory. After sample collection was complete, organism injection was stopped, and clean water was pumped through the test system at the test flow rate until the next sampling point. At the conclusion of each challenge test, a post-challenge membrane integrity test was conducted.

The test procedure can be summarized as follows:

1. Backwash for >1 minute at desired flux rate;
2. Rinse the module at least 5 minutes, until total chlorine in the effluent is not detectable;
3. Measure water parameters and collect water chemistry samples for laboratory analysis;
4. Conduct a pre-challenge pressure decay test (PDT);
5. Rinse for >5 minutes;
6. Collect flush and matrix spikes (feed flush, filtrate flush, feed matrix spike and filtrate matrix spike);
7. Set operating conditions at targeted flux/flow rate;
8. Start injection (time 0:00) and sample the influent and effluent after a minimum of 3 minutes;
9. Start injection (time 15:00) and sample the influent and effluent after a minimum of 2 minutes;
10. Start injection (time 30:00) and sample the influent and effluent after a minimum of 2 minutes;
11. Complete a post-challenge test PDT;
12. Sanitize and rinse rig and module.

## Quality Assurance/Quality Control and Data Management

An important aspect of certification testing is the QA/QC procedures and requirements. Careful adherence to the procedures ensures that the data presented in this report is of sound quality, is defensible, and is representative of the equipment performance. The primary areas of evaluation were representativeness, accuracy, and precision.

All testing activities were conducted in accordance with the provisions of the NSF International Laboratories Quality Assurance Manual. NSF International (NSF) is an independent third-party testing and certification organization accredited to ISO/IEC 17065, which applies to the requirements for bodies operating product certification systems, and ISO/IEC 17025, which contains the general requirements for the competence of testing and calibration facilities and organizations.

### Sample Handling

All samples analyzed by the NSF Chemistry and Microbiology Laboratories were labeled with unique identification numbers. All samples were analyzed within allowable holding times.

### Chemistry Laboratory QA/QC

The calibrations of all analytical instruments and the analyses of all parameters complied with the QA/QC provisions of the NSF International Laboratories Quality Assurance Manual.

The NSF QA/QC requirements are all compliant with those given in the USEPA method or Standard Method for the parameter. Also, every analytical method has an NSF standard operating procedure.

### Microbiology Laboratory QA/QC

#### Growth Media Positive Controls

All media were checked for sterility and growth response when prepared and when used for microorganism enumeration. The media was discarded if growth occurred on the sterility check media, or if there was an absence of growth in the positive response check.

#### Negative Controls

For each sample batch processed, an unused membrane filter and a blank with 100 mL of buffered, sterilized dilution water was filtered through the membrane were also placed onto the appropriate media and incubated with the samples as negative controls. 0.92 log was observed in the filtrate blank for one challenge test, however the effluent readings during this test were noted to have a maximum of 0.10 log, as such the integrity of the test was not compromised by the positive counts. Aside from this test, the highest log concentration of bacillus seen in filtrate blank samples was 0.10 log.

#### Documentation

All laboratory activities were documented using specially prepared laboratory bench sheets and NSF laboratory data reports. Data from the bench sheets were entered into a spreadsheet. The spreadsheet was used to calculate the geometric means and $\log_{10}$ reductions.

### Data Quality Indicators

The quality of data generated for this certification is established through four indicators of data quality: representativeness, accuracy, precision, and completeness.

#### Representativeness

Representativeness is a qualitative term that expresses "the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition." Representativeness was assured by consistent execution of the test protocol for each challenge, including timing of sample collection, sampling procedures, and sample preservation.

Representativeness was also ensured by using each analytical method at its optimum capability to provide results that represent the most accurate and precise measurement it is capable of achieving.

#### Accuracy

Accuracy was quantified as the percent recovery of the parameter in a sample of known quantity. Accuracy was measured through use of both matrix spikes of a known quantity and certified standards during calibration of an instrument.

The following equation was used to calculate percent recovery:

**Equation 1 - % Recovery**

$$Percent\ Recovery = 100 \times \left[ {}^{X_{known} - X_{measured}}/_{X_{known}} \right]$$

where: $X_{known}$ = known concentration of the measured parameter
$X_{measured}$ = measured concentration of parameter

Accuracy of the bench top chlorine, pH, and turbidity meters was checked daily during the calibration procedures using certified check standards. Alkalinity and TDS were analyzed in batches with samples from other NSF testing activities. Certified QC standards and/or matrix spikes were run with each batch. The NSF Laboratory Quality Assurance Manual establishes the frequency of spike sample analyses at 10% of the samples analyzed for chemical analyses. Laboratory control samples are also run at a frequency of 10%. The recovery limits specified for the parameters in this verification, excluding microbiological analyses, were 70-130% for laboratory-fortified samples and 85-115% for laboratory control samples.

#### Precision

Precision refers to the degree of agreement among individual measurements and provides an estimate of random error. For each challenge test, one set of challenge organism samples was collected in duplicate for precision analysis. Samples for alkalinity and TDS analysis were submitted to the NSF Chemistry Laboratory, where they were analyzed in batches with other samples. For these batches, one of every ten samples were analyzed in duplicate. Duplicate municipal drinking water samples were analyzed for pH, total chlorine, and turbidity as part of the daily instrument calibration process. Precision of duplicate analyses was measured by use of the following equation to calculate relative percent deviation (RPD):

**Equation 2 – Relative Percent Difference**

$$RPD = \left| \frac{S_1 - S_2}{S_1 + S_2} \right| \times 200$$

where:

$S_1$ = sample analysis result

$S_2$ = sample duplicate analysis result

Acceptable analytical precision was an RPD of 30%. All water chemistry duplicate analyses had an RPD of 30% or less, because NSF's policy is to not report results from an analytical run if the RPD too high. RPDs were also calculated for the log-transformed results of the duplicate MS2 and *Bacillus* sample pairs (data not shown). The log reduction values calculated from all *Bacillus* duplicate sample pairs had RPDs of 7.0% or less. Influent and effluent duplicate samples of MS2 had RPDs of 9.8% or less.

### Analytical Methods

A list of laboratory analytical methods can be found in Table 5. Single grab samples were collected for challenge organism numeration and were analyzed in triplicate.

**Table 5 - Analytical Methods for Laboratory Analyses**

| Analyte | Standard Method[1] | Hold Time | NSF Reporting Limit |
|---|---|---|---|
| *B. atrophaeus* Endospores | SM 9218 | 30 hours | 1 CFU/100 mL |
| MS2 | NSF/ANSI 55 | 24 hours | 1 PFU/mL |
| Temperature | N/A | none[2] | NA |
| pH | SM 4500-H+B | none[2] | NA |
| Turbidity | SM 2130B | none[2] | 0.1 NTU |
| Total Chlorine[2] | SM 4500-Cl G | none[2] | 0.05 mg/L |
| Alkalinity (total, as $CaCO_3$) | SM 2320B | 14 days | 5 mg/L |
| Total Organic Carbon (TOC) | SM 5310 C | 28 days | 0.1 mg/L |
| Total Dissolved Solids (TDS) | SM 2540 C | 7 days | 5 mg/L |
| Iron[3] | SM 200.7 | 6 months | 0.020 mg/L |
| Manganese[3] | SM 200.7 | 6 months | 0.001 mg/L |
| HPC | SM 9215 | 30 hours | 1 CFU/100 mL |

[1]*Standard Methods for the Examination of Water and Wastewater*
[2]*Add as needed to indicate all oxidants detected or potentially present in test water.*

## *Bacillus* Results and Discussion

### Water Quality Data for All Challenges

The results of the test water analyses are presented in Table 6 for all challenge tests. Heterotrophic plate counts (HPC) are reported for 48 hours at 35°C.

**Table 6 - Water Quality Analysis Results**

| Mod. | Temp (°F) | pH | Turbidity (NTU) | Total $Cl_2$ (mg/L) | Alkalinity (mg/L as $CaCO_3$) | TOC (mg/L) | TDS (mg/L) | Iron (mg/L) | Mn (mg/L) | HPC (CFU/ml) | Pass QA / QC? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *QA / QC Criteria* | *50 - 81°F* | *6.5 - 8.5* | *<0.3 NTU* | *Non-detect* | *>20 mg/L as $CaCO_3$* | *Meas.& report* | *Meas.& report* | *Rec. non-detect & <0.3 mg/L* | *Rec. non-detect & <0.3 mg/L* | *<500 CFU/mL* | - |
| #1 Bac | 61.0 | 7.05 | 0.16 | ND (<0.05) | 37 | 1.9 | 380 | ND (<0.02) | ND (<0.001) | 1.25E+01 | Yes |
| #2 Bac | 61.7 | 7.11 | 0.13 | | 38 | 1.8 | 380 | | | 1.35E+01 | Yes |
| #3 Bac | 69.9 | 7.03 | 0.14 | | 17 | 1.7 | 380 | | | 2.80E+01 | Yes |
| #4 Bac | 66.1 | 6.94 | 0.10 | | 60 | 2.0 | 340 | | | 1.00E+01 | Yes |
| #5 Bac | 66.5 | 7.08 | 0.13 | | 56 | 2.0 | 350 | | | 3.00E+00 | Yes |
| #2 Cut Fiber Bac | 64.1 | 7.08 | 0.15 | | 57 | 2.0 | 360 | | | 3.00E+00 | Yes |
| #3 Cut Fiber Bac | 64.1 | 7.01 | 0.14 | | 56 | 2.0 | 340 | | | 2.00E+00 | Yes |
| #1 Poked Hole Bac | 71.5 | 7.00 | 0.09 | | 42 | 2.4 | 270 | | 0.001 | 3.65E+01 | Yes |

The results in Table 6 indicate stable test water that conforms to the requirements of NSF 419. All parameters were within the recommended range and not likely formed a cake during the testing or otherwise biased results.

### Summary of Measured System Operating Conditions

Tables 7 and 8 summarize measurements collected for each module tested during the *Bacillus* challenge tests.

**Table 7 - Test Operating Conditions Bacillus**

| | |
|---|---|
| Module manufacturer and model number | Toray HFUG-2020AN |
| Background PDR or Dbase (psi/min) | n/a |
| Target LRV ($log_{10}$) | >6.0 |
| Challenge Particle Feed Rate (gpm) | 0.404 gpm |
| Hold up volume (Vhold, gallons) | 34.0 liters, 8.98 gallons |
| Equilibrium volume (Veq, gallons) | 26.9 |
| Safety Factor (SF) based on Equilibrium volume | 6.0 |
| Total Volume (Vtest, gallons) | 2826 |
| Minimum feed concentration target ($C_f$-min) | 1.00 x$10^6$ CFU/100ml |
| Maximum feed concentration target ($C_f$-max) | 3.16 x$10^6$ CFU/100ml |
| NDPT method & target pressure | 10 minute pressure decay from 18.85 |
| Initial QCRV (psi/min) | < 0.026 psi/min |

**Table 8 - Test Operating Measurements Bacillus**

| Module number / ID | #1 | #2 | #3 | #4 | #5 | #2 Cut Fiber | #3 Cut Fiber | #1 Poked Hole |
|---|---|---|---|---|---|---|---|---|
| Module serial number | 418050217 | 418060016 | 418050182 | 418050261 | F418050282 | 418060016 | 418050182 | 418050217 |
| Backwash flow rate (gpm) | 81.00 | 80.85 | 81.07 | 80.85 | 81.02 | 80.90 | 81.10 | 80.96 |
| Backwash time (min) | 2.00 | 2.00 | 2.00 | 5.00 | 2.00 | 1.00 | 2.00 | 2.00 |
| Rinse flow rate (gpm) | 80.95 | 80.84 | 80.77 | 80.95 | 80.82 | 81.11 | 81.06 | 81.04 |
| Rinse time (min) | 5.00 | 5.00 | 10.00 | 11.00 | 5.00 | 5.00 | 5.00 | 8.00 |
| Starting feed flow (gpm) | 81.09 | 80.82 | 80.77 | 80.95 | 80.94 | 80.12 | 81.06 | 80.87 |
| Ending feed flow (gpm) | 81.18 | 80.92 | 80.92 | 81.17 | 81.05 | 81.19 | 81.39 | 80.96 |
| Recovery (%) | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Average flux (gfd) | 120.57 | 120.18 | 120.14 | 120.46 | 120.36 | 119.86 | 120.71 | 120.25 |
| Starting flux (gfd) | 120.51 | 120.10 | 120.03 | 120.30 | 120.28 | 119.06 | 120.46 | 120.18 |
| Ending flux (gfd) | 120.64 | 120.25 | 120.25 | 120.62 | 120.45 | 120.65 | 120.95 | 120.31 |
| Average TMP (psi) | 18.16 | 15.49 | 16.27 | 16.60 | 16.14 | 16.28 | 18.09 | 16.27 |
| Starting feed pressure (psi) | 24.55 | 22.13 | 22.28 | 21.88 | 21.42 | 21.56 | 23.83 | 21.75 |
| Ending feed pressure (psi) | 24.30 | 21.97 | 23.05 | 23.62 | 23.19 | 22.92 | 25.26 | 22.80 |
| Starting filtrate press. (psi) | 2.59 | 2.87 | 2.75 | 2.42 | 2.54 | 2.25 | 2.84 | 2.30 |
| Ending filtrate press. (psi) | 2.60 | 2.90 | 2.72 | 2.50 | 2.41 | 2.31 | 2.71 | 2.35 |
| Starting TMP (psi) | 18.29 | 15.58 | 15.86 | 15.77 | 15.19 | 15.63 | 17.31 | 15.77 |
| Ending TMP (psi) | 18.03 | 15.39 | 16.67 | 17.43 | 17.09 | 16.93 | 18.87 | 16.77 |
| Average DIT PDR (psi/min) | 0.006 | 0.001 | 0.002 | -0.001 | -0.001 | 1.000 | 0.942 | 0.048 |
| Pre-challenge test DIT results | | | | | | | | |
| DIT starting pressure (psi) | 18.99 | 18.96 | 18.93 | 19.10 | 18.98 | 18.85 | 18.89 | 18.87 |
| DIT ending pressure (psi) | 18.93 | 18.95 | 18.91 | 19.10 | 18.98 | 8.87 | 9.48 | 18.38 |
| DIT duration (minutes) | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Pretest PDR (psi/min) | 0.006 | 0.001 | 0.002 | 0.000 | 0.000 | 0.998 | 0.941 | 0.049 |
| Post challenge test DIT results | | | | | | | | |
| DIT starting pressure (psi) | 19.03 | 18.95 | 18.92 | 18.92 | 18.98 | 18.94 | 18.83 | 18.85 |
| DIT ending pressure (psi) | 18.96 | 18.94 | 18.91 | 18.94 | 18.99 | 8.93 | 9.40 | 18.38 |
| DIT duration (minutes) | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Post-test PDR (psi/min) | 0.006 | 0.001 | 0.001 | -0.002 | -0.001 | 1.001 | 0.943 | 0.047 |

The different elevations of the feed and filtrate pressure gauges in the test system were accounted for in the calculation of the transmembrane pressure (TMP). The TMP was calculated using the following equation:

**Equation 3 – Transmembrane Pressure**

$$TMP(psig) = Feed\ Pressure\ (psig) - \left[Filtrate\ Pressure\ (psig) + \frac{h}{12} \times 0.4335\right]$$

Where "h" is the elevation in inches of the filtrate gauge above the pressure gauge on the feed side of the membrane and was between 101.375 - 102.125 inches for all tests.

**Summary of Log Removal Value Results**

For presentation of the challenge organism data in this chapter, the observed triplicate counts were averaged by calculating geometric means, as suggested for microbial enumeration data in Standard Method 9020. For tests using *Bacillus atrophaeus* endospores as the challenge organism, geometric means of less than 1 CFU/100 mL were rounded up to 1 if endospore colonies were found on any of the three individual counts. A mean count of less than 1 CFU/100 mL was reported only if all three triplicate analyses had no organisms found. The mean

counts were $log_{10}$ transformed for calculating log removal values (LRV). The mean counts were $log_{10}$ transformed for calculating log removal values (LRV) using Equation 4 (3.7 in the Membrane Filtration Guidance Manual - MFGM, USEPA 2005), as shown below:

**Equation 4 – Log Removal Value**

$$LRV = log_{10}(C_f) - log_{10}(C_p)$$

where: $C_f$ = geometric mean of the feed concentration replicate samples
$C_p$ = geometric mean of the filtrate concentration replicate samples

For tests using *Bacillus atrophaeus* endospores NSF targeted approximately 6.26 logs for the challenge concentration. The LT2ESWTR MFGM calls for the maximum challenge concentration to be 6.5 $log_{10}$ ($3.16x10^6$) above the organism's detection limit, which is 1 CFU/100 mL for the membrane filtration enumeration method. In NSF Standard 419, should the measured feed concentration exceed 6.5 logs, the lab can reset the feed concentrations to 6.5 logs for calculating log reductions. For these tests, there was no need to cap results as no challenge exceeded 6.5 $log_{10}$ ($3.16x10^6$) above the organism's detection limit. Consequently, the LRV for the test was calculated without the capped challenge tests.

**Table 9 - Test Sample Results Bacillus**

| Module Mfr., Model | | Toray HFUG-2020AN | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test method | | SM 9218 | | | Challenge Particle | *Bacillus atrophaeus* | | | | |
| # of Filters Tested | | 5 | | | Size Range (µm) | mean ϕ = 0.8 µm, mean L = 1.8 µm | | | | |
| $LRV_{C\text{-}Test}$ | | *See following section* | | | Detection Limit | 1 CFU/100 mL | | | | |
| | | Feed Water (Influent) CFU/100mL | | | | Filtrate Water (Effluent) CFU/100mL | | | | Met QA/ QC? |
| Mod. | Test Condition | Initial | Duplicate | Triplicate | GMf = Cf | Initial | Duplicate | Triplicate | GMp = Cp | |
| Mod #1 | Flush | 1.40E+02 | 1.42E+02 | 1.49E+02 | 1.44E+02 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | 1.85E+06 | 1.56E+06 | 1.33E+06 | 1.57E+06 | 1.97E+06 | 1.71E+06 | 1.62E+06 | 1.76E+06 | Yes |
| | Start-up | 1.76E+06 | 1.57E+06 | 1.65E+06 | 1.66E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Start-up Dup. | 1.75E+06 | 1.72E+06 | 1.66E+06 | 1.71E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 15 min | 1.95E+06 | 1.65E+06 | 1.57E+06 | 1.72E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 30 min | 2.01E+06 | 1.68E+06 | 1.60E+06 | 1.75E+06 | **1.00E+00** | **1.00E+00** | 1.00E+00 | 1.00E+00 | Yes |
| Mod #2 | Flush | 1.00E+00 | **1.00E+00** | **1.00E+00** | 1.00E+00 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | 1.77E+06 | 1.85E+06 | 1.74E+06 | 1.79E+06 | 1.55E+06 | 2.46E+06 | 1.73E+06 | 1.88E+06 | Yes |
| | Start-up | 1.62E+06 | 1.90E+06 | 1.61E+06 | 1.70E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Start-up Dup. | 1.54E+06 | 1.30E+06 | 1.42E+06 | 1.42E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 15 min | 1.51E+06 | 1.35E+06 | 1.62E+06 | 1.49E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 30 min | 1.70E+06 | 1.45E+06 | 1.53E+06 | 1.56E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |

| Mod. | Test Condition | Feed Water (Influent) CFU/100mL | | | | Filtrate Water (Effluent) CFU/100mL | | | | Met QA/ QC? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Duplicate | Triplicate | GMf = Cf | Initial | Duplicate | Triplicate | GMp = Cp | |
| Mod #3 | Flush | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | 1.64E+06 | 1.55E+06 | 1.51E+06 | 1.57E+06 | 1.60E+06 | 1.51E+06 | 1.38E+06 | 1.49E+06 | Yes |
| | Start-up | 1.34E+06 | 1.24E+06 | 1.21E+06 | 1.26E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Start-up Dup. | 1.51E+06 | 1.47E+06 | 1.14E+06 | 1.36E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 15 min | 1.32E+06 | 1.23E+06 | 1.01E+06 | 1.18E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 30 min | 1.25E+06 | 1.15E+06 | 1.05E+06 | 1.15E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| Mod #4 | Flush | 1.00E+00 | 1.00E+00 | **1.00E+00** | 1.00E+00 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | 1.73E+06 | 1.64E+06 | 1.64E+06 | 1.67E+06 | 1.56E+06 | 1.48E+06 | 1.45E+06 | 1.50E+06 | Yes |
| | Start-up | 1.43E+06 | 1.35E+06 | 1.32E+06 | 1.37E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Start-up Dup. | 1.55E+06 | 1.45E+06 | 1.19E+06 | 1.39E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 15 min | 1.96E+06 | 1.90E+06 | 1.87E+06 | 1.91E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | 30 min | 1.77E+06 | 1.54E+06 | 1.53E+06 | 1.61E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| Mod #5 | Flush | 7.00E+00 | 1.00E+01 | 8.00E+00 | 8.24E+00 | **1.00E+00** | 1.90E+01 | 3.00E+01 | 8.29E+00 | Yes |
| | Matrix Spike | 1.54E+06 | 1.72E+06 | 1.59E+06 | 1.61E+06 | 1.80E+06 | 1.57E+06 | 1.60E+06 | 1.65E+06 | Yes |
| | Start-up | 1.61E+06 | 1.55E+06 | 1.73E+06 | 1.63E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Start-up Dup. | 1.59E+06 | 1.54E+06 | 1.67E+06 | 1.60E+06 | **1.00E+00** | **1.00E+00** | 2.00E+00 | 1.00E+00 | Yes |
| | 15 min | 1.45E+06 | 1.22E+06 | 1.35E+06 | 1.34E+06 | 1.00E+00 | **1.00E+00** | **1.00E+00** | 1.26E+00 | Yes |
| | 30 min | 1.51E+06 | 1.71E+06 | 1.49E+06 | 1.57E+06 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| Mod #2 Cut Fiber | Flush | **1.00E+00** | **1.00E+00** | 1.50E+01 | 2.47E+00 | 1.00E+00 | 2.00E+00 | **1.00E+00** | 1.26E+00 | Yes |
| | Matrix Spike | 2.70E+06 | 2.01E+06 | 2.24E+06 | 2.30E+06 | 2.50E+06 | 1.90E+06 | 2.02E+06 | 2.12E+06 | Yes |
| | Start-up | 2.37E+06 | 3.00E+06 | 2.70E+06 | 2.68E+06 | 3.87E+02 | 4.20E+02 | 6.00E+02 | 4.60E+02 | Yes |
| | Start-up Dup. | 2.02E+06 | 1.96E+06 | 2.02E+06 | 2.00E+06 | 5.40E+02 | 5.60E+02 | 4.50E+02 | 5.14E+02 | Yes |
| | 15 min | 1.92E+06 | 2.50E+06 | 2.60E+06 | 2.32E+06 | 7.00E+02 | 5.90E+02 | 5.70E+02 | 6.17E+02 | Yes |
| | 30 min | 2.90E+06 | 2.10E+06 | 2.90E+06 | 2.60E+06 | 6.60E+02 | 5.50E+02 | 5.60E+02 | 5.88E+02 | Yes |
| Mod #3 Cut Fiber | Flush | 6.00E+00 | 5.00E+00 | 3.00E+00 | 4.48E+00 | **1.00E+00** | **1.00E+00** | 1.00E+00 | 1.00E+00 | Yes |
| | Matrix Spike | 2.70E+06 | 2.30E+06 | 1.94E+06 | 2.29E+06 | 2.01E+06 | 1.86E+06 | 1.63E+06 | 1.83E+06 | Yes |
| | Start-up | 3.10E+06 | 3.00E+06 | 2.50E+06 | 2.85E+06 | 3.84E+02 | 3.80E+02 | 3.74E+02 | 3.79E+02 | Yes |
| | Start-up Dup. | 2.00E+06 | 2.09E+06 | 2.01E+06 | 2.03E+06 | 3.68E+02 | 3.57E+02 | 3.55E+02 | 3.60E+02 | Yes |
| | 15 min | 2.50E+06 | 2.30E+06 | 2.20E+06 | 2.33E+06 | 3.79E+02 | 3.75E+02 | 3.56E+02 | 3.70E+02 | Yes |
| | 30 min | 2.80E+06 | 2.40E+06 | 2.00E+06 | 2.38E+06 | 3.62E+02 | 3.49E+02 | 3.47E+02 | 3.53E+02 | Yes |
| Mod 1 Poke Hole | Flush | 5.00E+00 | 4.00E+00 | 2.00E+00 | 3.42E+00 | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | 2.30E+06 | 2.30E+06 | 3.00E+06 | 2.51E+06 | 1.71E+06 | 2.60E+06 | 2.20E+06 | 2.14E+06 | Yes |
| | Start-up | 1.58E+06 | 1.63E+06 | 1.35E+06 | 1.51E+06 | 1.00E+01 | 1.10E+01 | 1.00E+01 | 1.03E+01 | Yes |
| | Start-up Dup. | 1.63E+06 | 1.56E+06 | 1.63E+06 | 1.61E+06 | 7.00E+00 | 8.00E+00 | 1.00E+01 | 8.24E+00 | Yes |
| | 15 min | 2.40E+06 | 2.10E+06 | 2.80E+06 | 2.42E+06 | 1.00E+01 | 2.00E+01 | 1.80E+01 | 1.53E+01 | Yes |
| | 30 min | 2.40E+06 | 2.30E+06 | 2.80E+06 | 2.49E+06 | 1.30E+01 | 2.20E+01 | 1.40E+01 | 1.59E+01 | Yes |

***Red*** *text indicates no endospores were found*

### Log Removal Value of the Challenge Test, $LRV_{C\text{-}Test}$

The LT2ESWTR and MFGM specify that an LRV for the test ($LRV_{C\text{-}Test}$) be calculated for each module tested, and that the LRVs for each module are then combined to yield a single $LRV_{C\text{-}Test}$ for the product. If fewer than 20 modules are tested, as was the case for this test, the $LRV_{C\text{-}Test}$ is simply the lowest LRV for the individual modules. However, the rule does not specify a method to calculate $LRV_{C\text{-}Test}$ for each module. Suggested options in the MFGM include:

1. Calculate an LRV for each feed/filtrate sample pair, then calculate the average of the individual sample point LRVs;
2. Average all the feed and filtrate counts, and then calculate a single LRV for the module; or
3. Calculate an LRV for each feed/filtrate sample pair; select the LRV for the module as the lowest (most conservative of the three options).

NSF selected option 3 as the most conservative calculation.

### *B. atrophaeus* Endospore Challenge Test Results

The *Bacillus* challenge results are displayed below. Under Option 3, the $LRV_{C\text{-}Test}$ for the Toray HFUG-2020AN modules is 5.17 $log_{10}$. This $LRV_{C\text{-}Test}$ is based on the start-up sample result of Module #1 Poked hole. The Cut Fiber modules are not considered for the $LRV_{C\text{-}Test}$ as the decay rate is outside the established range for QCRV.

**Table 10 - Challenge Test Results Bacillus**

| Mod. | Test Condition | Feed (CFU/100 mL) | | Permeate (CFU/100 mL) | | $LRV_{Condition}$ (log) | Met QA/QC? |
|---|---|---|---|---|---|---|---|
| | | $C_f$ | $Log_{10}(C_f)$ | $C_P$ | $Log_{10}(C_P)$ | | |
| Mod #1 | Start-up | 1.66E+06 | 6.22 | 1.00E+00 | 0.00 | 6.22 | Yes |
| | Start-up Dup. | 1.71E+06 | 6.23 | 1.00E+00 | 0.00 | 6.23 | Yes |
| | After 15 min | 1.72E+06 | 6.23 | 1.00E+00 | 0.00 | 6.23 | Yes |
| | After 30 min | 1.75E+06 | 6.24 | 1.00E+00 | 0.00 | 6.24 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **6.22** | |
| Mod #2 | Start-up | 1.70E+06 | 6.23 | 1.00E+00 | 0.00 | 6.23 | Yes |
| | Start-up Dup. | 1.42E+06 | 6.15 | 1.00E+00 | 0.00 | 6.15 | Yes |
| | After 15 min | 1.49E+06 | 6.17 | 1.00E+00 | 0.00 | 6.17 | Yes |
| | After 30 min | 1.56E+06 | 6.19 | 1.00E+00 | 0.00 | 6.19 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **6.15** | |
| Mod #3 | Start-up | 1.26E+06 | 6.10 | 1.00E+00 | 0.00 | 6.10 | Yes |
| | Start-up Dup. | 1.36E+06 | 6.13 | 1.00E+00 | 0.00 | 6.13 | Yes |
| | After 15 min | 1.18E+06 | 6.07 | 1.00E+00 | 0.00 | 6.07 | Yes |
| | After 30 min | 1.15E+06 | 6.06 | 1.00E+00 | 0.00 | 6.06 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **6.06** | |
| Mod #4 | Start-up | 1.37E+06 | 6.14 | 1.00E+00 | 0.00 | 6.14 | Yes |
| | Start-up Dup. | 1.39E+06 | 6.14 | 1.00E+00 | 0.00 | 6.14 | Yes |
| | After 15 min | 1.91E+06 | 6.28 | 1.00E+00 | 0.00 | 6.28 | Yes |
| | After 30 min | 1.61E+06 | 6.21 | 1.00E+00 | 0.00 | 6.21 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **6.14** | |

| Mod. | Test Condition | Feed (CFU/100 mL) | | Permeate (CFU/100 mL) | | $LRV_{Condition}$ (log) | Met QA/ QC? |
|---|---|---|---|---|---|---|---|
| | | $C_f$ | $Log_{10}(C_f)$ | $C_P$ | $Log_{10}(C_P)$ | | |
| Mod #5 | Start-up | 1.63E+06 | 6.21 | **1.00E+00** | 0.00 | 6.21 | Yes |
| | Start-up Dup. | 1.60E+06 | 6.20 | 1.26E+00 | 0.10 | 6.10 | Yes |
| | After 15 min | 1.34E+06 | 6.13 | 1.00E+00 | 0.00 | 6.13 | Yes |
| | After 30 min | 1.57E+06 | 6.20 | **1.00E+00** | 0.00 | 6.20 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **6.10** | |
| Mod #2 Cut Fiber | Start-up | 2.68E+06 | 6.43 | 4.60E+02 | 2.66 | 3.76 | Yes |
| | Start-up Dup. | 2.00E+06 | 6.30 | 5.14E+02 | 2.71 | 3.59 | Yes |
| | After 15 min | 2.32E+06 | 6.37 | 6.17E+02 | 2.79 | 3.57 | Yes |
| | After 30 min | 2.60E+06 | 6.42 | 5.88E+02 | 2.77 | 3.65 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **3.57** | |
| Mod #3 Cut Fiber | Start-up | 2.85E+06 | 6.46 | 3.79E+02 | 2.58 | 3.88 | Yes |
| | Start-up Dup. | 2.03E+06 | 6.31 | 3.60E+02 | 2.56 | 3.75 | Yes |
| | After 15 min | 2.33E+06 | 6.37 | 3.70E+02 | 2.57 | 3.80 | Yes |
| | After 30 min | 2.38E+06 | 6.38 | 3.53E+02 | 2.55 | 3.83 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **3.75** | |
| Mod #1 Poke Hole | Start-up | 1.51E+06 | 6.18 | 1.03E+01 | 1.01 | 5.17 | Yes |
| | Start-up Dup. | 1.61E+06 | 6.21 | 8.24E+00 | 0.92 | 5.29 | Yes |
| | After 15 min | 2.42E+06 | 6.38 | 1.53E+01 | 1.19 | 5.20 | Yes |
| | After 30 min | 2.49E+06 | 6.40 | 1.59E+01 | 1.20 | 5.20 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | **5.17** | |
| | **$LRV_{C\text{-}Test}$ =** | | | | | **5.17** | |

*Red text indicates no endospores were found in all three triplicate analyses, and a value of 1 CFU/100 mL was used to calculate a log reduction.*

## MS2 Results and Discussion

### Water Quality Data for All Challenges

The results of the test water analyses are presented in Table 11 for all challenge tests. Heterotrophic plate counts (HPC) are reported for 48 hours at 35°C.

**Table 11 - Water Quality Analysis Results**

| Mod. | Temp (°F) | pH | Turbidity (NTU) | Total $Cl_2$ (mg/L) | Alkalinity (mg/L as $CaCO_3$) | TOC (mg/L) | TDS (mg/L) | Iron (mg/L) | Mn (mg/L) | HPC (CFU/ml) | Pass QA / QC? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *QA / QC Criteria* | *50 - 81°F* | *6.5 - 8.5* | *<0.3 NTU* | *Non-detect* | *>20 mg/L as $CaCO_3$* | *Meas. & report* | *Meas. & report* | *Rec. non-detect & <0.3 mg/L* | *Rec. non-detect & <0.3 mg/L* | *<500 CFU/mL* | - |
| #1 MS2 | 67.1 | 7.04 | 0.13 | ND (<0.05) | 50 | 1.9 | 380 | ND (0.02) | ND (0.001) | 4.15E+01 | Yes |
| #2 MS2 | 71.3 | 7.02 | 0.12 | ND (<0.05) | 41 | 1.8 | 400 | ND (0.02) | ND (0.001) | 3.00E+01 | Yes |
| #2 MS2 Cut Fiber | 66.8 | 7.22 | 0.10 | ND (<0.05) | 61 | 2.0 | 350 | ND (0.02) | ND (0.001) | 2.00E+00 | Yes |
| #3 MS2 Cut Fiber | 68.6 | 7.11 | 0.11 | ND (<0.05) | 57 | 2.0 | 340 | ND (0.02) | ND (0.001) | 1.00E+00 | Yes |

The results in Table 11 indicate stable test water that conforms to the requirements of NSF 419. All parameters were within the recommended range and not likely formed a cake during the testing or otherwise biased results.

### Summary of Measured System Operating Conditions

Tables 12 and 13 summarize the on-site data and measurements collected for these 12 steps for each module tested during the MS2 challenge tests.

**Table 12 - Test Operating Conditions MS2**

| | |
|---|---|
| Module manufacturer and model number | Toray HFUG-2020AN |
| Background PDR or Dbase (psi/min) | n/a |
| Target LRV ($log_{10}$) | >6.0 |
| Challenge Particle Feed Rate (gpm) | 0.404 gpm |
| Hold up volume (Vhold, gallons) | 34.0 liters, 8.98 gallons |
| Equilibrium volume (Veq, gallons) | 26.9 |
| Safety Factor (SF) based on Equilibrium volume | 6.0 |
| Total Volume (Vtest, gallons) | 2826 |
| Minimum feed concentration target ($C_f$-min) | 1.00 x$10^6$ CFU/100ml |
| Maximum feed concentration target ($C_f$-max) | 3.16 x$10^6$ CFU/100ml |
| NDPT method & target pressure | Toray HFUG-2020AN |
| Initial QCRV (psi/min) | n/a |

Table 13 - Test Operating Measurements MS2

| Module number / ID | #1 | #2 | #3 Cut Fiber | #1 Cut Fiber |
|---|---|---|---|---|
| Module serial number | F418050217 | F418060016 | F418060016 | F418050182 |
| Backwash flow rate (gpm) | 80.85 | 81.02 | 80.87 | 81.17 |
| Backwash time (min) | 1.00 | 2.00 | 5.00 | 5.00 |
| Rinse flow rate (gpm) | 80.99 | 80.91 | 81.23 | 81.19 |
| Rinse time (min) | 5.00 | 20.00 | 30.00 | 10.00 |
| Starting feed flow rate (gpm) | 81.28 | 80.78 | 80.95 | 81.03 |
| Ending feed flow rate (gpm) | 80.83 | 80.87 | 81.09 | 81.14 |
| Recovery (%) | 100 | 100 | 100 | 100 |
| Average flux (gfd) | 120.45 | 120.11 | 120.40 | 120.50 |
| Starting flux (gfd) | 120.79 | 120.04 | 120.30 | 120.42 |
| Ending flux (gfd) | 120.12 | 120.18 | 120.51 | 120.58 |
| Average TMP (psi) | 18.29 | 13.97 | 15.85 | 17.00 |
| Starting feed pressure (psi) | 24.35 | 20.06 | 21.79 | 22.56 |
| Ending feed pressure (psi) | 25.05 | 20.30 | 23.02 | 24.47 |
| Starting filtrate pressure (psi) | 2.81 | 2.49 | 2.81 | 2.84 |
| Ending filtrate pressure (psi) | 2.68 | 2.58 | 2.93 | 2.82 |
| Starting TMP (psi) | 17.87 | 13.90 | 15.30 | 16.04 |
| Ending TMP (psi) | 18.70 | 14.04 | 16.41 | 17.97 |
| Average DIT PDR (psi/min) | 0.007 | 0.001 | 0.981 | 0.839 |
| Pre-challenge test DIT results | | | | |
| DIT starting pressure (psi) | 18.90 | 18.87 | 19.04 | 18.83 |
| DIT ending pressure (psi) | 18.82 | 18.86 | 9.42 | 9.66 |
| DIT duration (minutes) | 10.00 | 10.00 | 10.00 | 10.00 |
| Pretest PDR (psi/min) | 0.008 | 0.002 | 0.962 | 0.917 |
| Post challenge test DIT results | | | | |
| DIT starting pressure (psi) | 19.03 | 19.00 | 18.85 | 18.84 |
| DIT ending pressure (psi) | 18.97 | 18.98 | 8.86 | 11.23 |
| DIT duration (minutes) | 10.00 | 10.00 | 10.00 | 10.00 |
| Post-test PDR (psi/min) | 0.006 | 0.001 | 0.999 | 0.761 |

The different elevations of the feed and filtrate pressure gauges in the test system were accounted for in the calculation of the transmembrane pressure (TMP). The TMP was calculated using the following equation:

Equation 5 – Transmembrane Pressure

$$TMP(psig) = Feed\ Pressure\ (psig) - \left[Filtrate\ Pressure\ (psig) + \frac{h}{12} \times 0.4335\right]$$

Where “h” is the elevation in inches of the filtrate gauge above the pressure gauge on the feed side of the membrane and was 101.500 - 102.000 inches for all tests.

**Summary of Log Removal Value Results**

For presentation of the challenge organism data in this chapter, the observed triplicate counts were averaged by calculating geometric means, as suggested for microbial enumeration data in Standard Method 9020. For tests using MS2 as the challenge organism, geometric means of less than 1 PFU/mL were rounded up to 1 if plaque forming units were found on any of the three individual counts. A mean count of less than 1 PFU/mL was

reported only if all three triplicate analyses had no plaque forming units found. The mean counts were $log_{10}$ transformed for calculating log removal values (LRV) using Equation 4 (shown in the previous report section.

For tests using MS2, NSF targeted a challenge concentration of 6.25 logs above the minimum detection limit (1 PFU/mL). The LT2ESWTR MFGM calls for the maximum challenge concentration to be 6.5 $log_{10}$ ($3.16x10^6$) above the organism's detection limit, which is 1 PFU/mL. In NSF Standard 419, should the measured feed concentration exceed 6.5 logs, the lab can reset the feed concentrations to 6.5 logs for calculating log reductions. For these tests, there was no need to cap results as no challenge exceeded 6.5 $log_{10}$ ($3.16x10^6$) above the organism's detection limit. Consequently, the LRV for the test was calculated without the capped challenge tests.

**Table 14 - Test Sample Results MS2**

| Module Mfr., Model | | Toray HFUG-2020AN | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test method | | NSF ANSI 55-Annex A | | | Challenge Particle | MS2 | | | | |
| # of Filters Tested | | 4 | | | Size Range (µm) | 22 to 26 nanometers | | | | |
| $LRV_{C-Test}$ | | *See following section* | | | Detection Limit | 1 PFU/ml | | | | |
| | | Feed Water (Influent) PFU/mL | | | | Filtrate Water (Effluent) PFU/mL | | | | Met |
| Mod. | Test Condition | Initial | Duplicate | Triplicate | GMf = Cf | Initial | Duplicate | Triplicate | GMp = Cp | QA/QC? |
| Mod #1 | Flush | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | 5.30E+05 | 5.10E+05 | 4.90E+05 | 5.10E+05 | 7.00E+05 | 5.80E+05 | 3.90E+05 | 5.41E+05 | Yes |
| | Start-up | 7.40E+05 | 5.00E+05 | 5.50E+05 | 5.88E+05 | 1.61E+04 | 1.47E+04 | 1.31E+04 | 1.46E+04 | Yes |
| | Start-up Dup. | 8.00E+05 | 7.00E+05 | 6.20E+05 | 7.03E+05 | 4.20E+04 | 2.31E+04 | 1.85E+04 | 2.62E+04 | Yes |
| | 15 min | 4.80E+05 | 3.40E+05 | 3.20E+05 | 3.74E+05 | 2.00E+04 | 1.89E+04 | 1.83E+04 | 1.91E+04 | Yes |
| | 30 min | 7.20E+05 | 6.60E+05 | 5.20E+05 | 6.28E+05 | 2.45E+04 | 2.33E+04 | 1.73E+04 | 2.15E+04 | Yes |
| Mod #2 | Flush | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Start-up | 8.20E+05 | 6.80E+05 | 5.20E+05 | 6.62E+05 | 1.53E+04 | 1.29E+04 | 1.21E+04 | 1.34E+04 | Yes |
| | Start-up Dup. | 8.70E+05 | 7.30E+05 | 5.80E+05 | 7.17E+05 | 1.46E+04 | 1.35E+04 | 1.98E+04 | 1.57E+04 | Yes |
| | 15 min | 1.92E+06 | 1.25E+06 | 1.01E+06 | 1.34E+06 | 2.00E+04 | 2.05E+04 | 1.55E+04 | 1.85E+04 | Yes |
| | 30 min | 1.39E+06 | 1.16E+06 | 9.60E+05 | 1.16E+06 | 1.56E+04 | 1.25E+04 | 1.58E+04 | 1.46E+04 | Yes |
| Mod #2 Cut Fiber | Flush | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | 1.00E+00 | 1.00E+00 | Yes |
| | Start-up | 9.12E+05 | 9.12E+05 | 5.37E+05 | 7.64E+05 | 8.50E+03 | 1.04E+04 | 1.36E+04 | 1.06E+04 | Yes |
| | Start-up Dup. | 3.30E+05 | 3.90E+05 | 3.72E+05 | 3.63E+05 | 8.70E+03 | 1.06E+04 | 1.80E+04 | 1.18E+04 | Yes |
| | 15 min | 6.90E+05 | 6.00E+05 | 6.70E+05 | 6.52E+05 | 1.16E+04 | 1.11E+04 | 1.85E+04 | 1.34E+04 | Yes |
| | 30 min | 3.80E+05 | 3.60E+05 | 2.70E+05 | 3.33E+05 | 2.50E+04 | 2.63E+04 | 3.16E+04 | 2.75E+04 | Yes |
| Mod #3 Cut Fiber | Flush | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Matrix Spike | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | **1.00E+00** | Yes |
| | Start-up | 3.59E+05 | 3.65E+05 | 5.35E+05 | 4.12E+05 | 3.90E+04 | 3.45E+04 | 3.66E+04 | 3.67E+04 | Yes |
| | Start-up Dup. | 3.70E+05 | 3.00E+05 | 4.45E+05 | 3.67E+05 | 1.37E+04 | 1.56E+04 | 1.63E+04 | 1.52E+04 | Yes |
| | 15 min | 8.70E+05 | 6.90E+05 | 5.70E+05 | 6.99E+05 | 3.30E+04 | 3.20E+04 | 3.90E+04 | 3.45E+04 | Yes |
| | 30 min | 4.40E+05 | 4.90E+05 | 4.90E+05 | 4.73E+05 | 2.97E+04 | 3.34E+04 | 4.04E+04 | 3.42E+04 | Yes |

***Red** text indicates no MS2 were found*

**MS2 Challenge Test Results**

As requested by the manufacturer, two intact modules and two compromised modules were challenge tested with the coliphage virus MS2 (ATCC 15597-Bl). MS2 challenge results displayed in Table 15 and PDT data is shown in Table 16. The decay rates for all modules ranged from 0.001 psi/min to 0.981 psi/min, and all observed LRV for each individual feed/filtrate sample pairs were within a range of 1.05 to 1.90. This testing was performed for informational purposes only and is not used to determine compliance to NSF 419, accordingly further analysis of the NDPT results or calculated LRV was not performed.

**Table 15 - Challenge Test Results MS2**

| Mod. | Test Condition | Feed (PFU/mL) | | Permeate (PFU/mL) | | $LRV_{Condition}$ (log) | Met QA/ QC? |
|---|---|---|---|---|---|---|---|
| | | $C_f$ | $Log_{10}(C_f)$ | $C_P$ | $Log_{10}(C_P)$ | | |
| Mod 1 | Start-up | 5.88E+05 | 5.77 | 1.46E+04 | 4.16 | 1.61 | Yes |
| | Start-up Dup. | 7.03E+05 | 5.85 | 2.62E+04 | 4.42 | 1.43 | Yes |
| | After 15 min | 3.74E+05 | 5.57 | 1.91E+04 | 4.28 | 1.29 | Yes |
| | After 30 min | 6.28E+05 | 5.80 | 2.15E+04 | 4.33 | 1.47 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | 1.29 | |
| Mod 2 | Start-up | 6.62E+05 | 5.82 | 1.34E+04 | 4.13 | 1.69 | Yes |
| | Start-up Dup. | 7.17E+05 | 5.86 | 1.46E+04 | 4.20 | 1.66 | Yes |
| | After 15 min | 1.34E+06 | 6.13 | 1.85E+04 | 4.27 | 1.86 | Yes |
| | After 30 min | 1.16E+06 | 6.06 | 1.57E+04 | 4.16 | 1.90 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | 1.66 | |
| Mod #2 Cut Fiber | Start-up | 7.64E+05 | 5.88 | 1.06E+04 | 4.03 | 1.86 | Yes |
| | Start-up Dup. | 3.63E+05 | 5.56 | 1.18E+04 | 4.07 | 1.49 | Yes |
| | After 15 min | 6.52E+05 | 5.81 | 1.34E+04 | 4.13 | 1.69 | Yes |
| | After 30 min | 3.33E+05 | 5.52 | 2.75E+04 | 4.44 | 1.08 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | 1.08 | |
| Mod #3 Cut Fiber | Start-up | 4.12E+05 | 5.62 | 3.67E+04 | 4.56 | 1.05 | Yes |
| | Start-up Dup. | 3.67E+05 | 5.56 | 1.52E+04 | 4.18 | 1.38 | Yes |
| | After 15 min | 6.99E+05 | 5.84 | 3.45E+04 | 4.54 | 1.31 | Yes |
| | After 30 min | 4.73E+05 | 5.67 | 3.42E+04 | 4.53 | 1.14 | Yes |
| | Membrane Module LRV = Lowest $LRV_{Condition}$ = | | | | | 1.05 | |

**Table 16 - MS2 Challenge Test Pressure Decay Data**

| Module | Decay Rates (psi/min) | | | MS2 $LRV_{C\text{-}Test}$ |
|---|---|---|---|---|
| | Initial | Final | Average | |
| #1 | 0.008 | 0.006 | 0.007 | 1.29 |
| #2 | 0.002 | 0.001 | 0.001 | 1.66 |
| #2 Cut Fiber | 0.962 | 0.999 | 0.981 | 1.08 |
| #3 Cut Fiber | 0.917 | 0.761 | 0.839 | 1.05 |

## Summary of System Integrity Evaluation

This section includes an evaluation of the membrane product integrity evaluation scheme with respect to *Bacillus* challenge testing for purposes of removal credit for *Cryptosporidium*. It begins with a discussion of the backpressure observed during the direct integrity test (DIT) used to evaluate the membrane integrity. This is followed by an evaluation of the direct integrity test pressure ($P_{test}$) and the air-liquid conversion ratio (ALCR) that is used to subsequently calculate the direct integrity test sensitivity ($LRV_{DIT}$), as well as the calculated log removal value demonstrated by the most recent direct integrity test results of the modules ($LRV_{Ambient}$).

#### Maximum Backpressure, $BP_{max}$

Backpressure during a direct integrity test, DIT, acts to prevent air bubbles from being released from breaches in the membranes when pressurized with air. The backpressure is generally attributable to water in undrained portions of the membrane module (pressurized membranes) or cell (submerged membranes). The maximum backpressure experienced during a DIT is generally experienced at one of the fiber ends near the potting, is specific to the membrane process configuration, and may either be dynamically determined, or a fixed variable determined at commissioning. Ideally, the maximum backpressure for submerged systems is calculated using data from level or pressure indicators for each DIT, however, regulating agencies may allow the use of a predetermined fixed value for use with every test. Using a fixed backpressure value may make more sense in the case of pressurized membranes were the water level causing the backpressure is more controlled due to fixed piping configurations.

For submerged membrane systems, the insides of the membrane fibers are typically pressurized during a DIT and the backpressure results from the water level in the tank or cell that the modules are submerged in. In many instances of pressurized membrane systems, the backpressure experienced while air is introduced into the feed side of the membranes is due to the water remaining in the membrane modules as well as in the header piping. Typically, the maximum backpressure occurs at the bottommost membrane fibers, since that is the highest column of water pressing back against the air pressure on the inside of the fibers. In some plants, there may be an undrained column of water on the membrane side of the pressure transmitter, which must be accounted for when determining the actual starting and ending test pressures.

The maximum back pressure observed during the challenge testing was 2.98 psi.

#### $P_{test}$ – Applied Direct Integrity Test Pressure

Theoretical LRV calculations are predicated on pressure decay rates sensitive enough to detect breaches in the membranes. Therefore, the DIT is key for membrane performance verification. It is also relevant for obtaining regulatory approval of membranes for such treatment as the LT2ESWTR states a membrane will be awarded *Cryptosporidium* removal credit based on the lower of either the challenge testing LRV or the maximum LRV that can be verified through DIT (40 CFR § 141.719(b)(1)). The LT2ESWTR also specifies that the DIT have a resolution of 3 µm, commensurate with detecting *Cryptosporidium* oocyst-sized breaches. For reference, oocysts of *C. parvum* are generally considered to be in the 4 to 6 µm size range.

There are two main types of DIT methods: pressure-based tests and marker-based tests. This section will focus on pressure-based tests since they are typically applied to microfiltration (MF) and UF membranes. For the purposes of meeting the required DIT resolution of 3 µm, the following equation is used to determine the minimum direct integrity test pressure ($P_{test}$):

**Equation 6 – General Equation for $P_{test}$**

$$P_{test} = (0.193 \times K \times \sigma \times cos\theta) + BP_{max}$$

where:
- 0.193 = a factor that incorporates the 3µm defect diameter
- K = pore shape correction factor (dimensionless)
- σ = surface tension at the air-liquid interface (dynes/cm)
- Θ = liquid membrane contact angle (degrees)
- $BP_{max}$ = maximum backpressure on the system during the test (psi)

If the baseline diffusive losses through the fully intact membrane modules being tested is known, then this decay could be added to $P_{test}$ to arrive at a starting test pressure. Regardless of the initial starting pressure, the pressure at the end of the DIT must be greater than or equal to $P_{test}$ to meet the 3 µm resolution requirement. Conservative values yielding the highest test sensitivity can be achieved by using the following substitutions:

- K = 1
- σ = 74.9 dynes/cm at 5 °C water temperature
- Θ = 0°

Given the substitutions above, the equation for the applied test pressure simplifies to the following form Equation 6 (MFGM Equation 4.2):

**Equation 7 – Reduced Equation for $P_{test}$**

$$P_{test} = 14.5 + BP_{max}$$

Equation 6 indicates that the minimum test pressure necessary to achieve a 3 µm resolution is 14.5 psi plus the maximum backpressure on the system during application of a pressure-based DIT. The applied test pressure may be used as the $P_{test}$ term for the purposes of determining the ALCR.

Liquid membrane contact (e.g., "wetting angle") is measured in degrees and indicated by $\Theta$. The $\Theta$ value is used in determining the DIT pressures needed to meet the 3 µm resolution requirements under the LT2ESWTR. The pressure applied during a DIT must be great enough to overcome the capillary forces due to a 3 µm breach, thus ensuring that any breach large enough to pass *Cryptosporidium* oocysts would also pass air during the test. The contact angle is the angle at which a liquid / vapor interface meets a solid surface and is unique to a membrane material and type. The liquid membrane contact angle generally ranges from 0 to 90° and is primarily a function of the membrane hydrophilicity, which can be characterized in general terms as the affinity of the membrane material for water. In the absence of other data, a conservative value of $\Theta$ = 0° is suggested in the MFGM, and any value for $\Theta$ other than 0° will need to be well documented and approved by the regulatory authority if used for the purposes of compliance with the LT2ESWTR.

**Table 17 - Direct Integrity Test Pressure**

| Fixed Constants | | $P_{test}$ Equation | | | | |
|---|---|---|---|---|---|---|
| K | 1 | $P_{test} = (0.193 \times K \times \sigma \times cos\theta) + BP_{max}$ | | | | |
| σ (dynes/cm) | 74.9 | | | | | |
| ɵ (degrees) | 0 | | | | | |
| $BP_{max}$ (psi) | 2.98 | | | | | |
| $D_{base}$ (psi/min)[1] | n/a | Challenge test target $P_{test}$ determined from formula above (psi) | | | | 17.44 |
| DIT Duration (min) | 10 | DIT Test pressure recommended by membrane manufacturer (psi) | | | | 18.85 |
| Module ID | | Test | Starting Pressure (psi) | Ending Pressure (psi) | $\Delta P_{test}$ (psi/min) | Ending Pressure ≥ Target $P_{test}$? |
| #1 | | Pre-Challenge | 18.990 | 18.932 | 0.006 | Yes |
| | | Post Challenge | 19.027 | 18.964 | 0.006 | Yes |
| #1 Poke Hole | | Pre-Challenge | 18.87 | 18.376 | 0.049 | Yes |
| | | Post Challenge | 18.85 | 18.378 | 0.047 | Yes |
| #2 Cut Fiber | | Pre-Challenge | 18.85 | 8.87 | 0.998 | No |
| | | Post Challenge | 18.94 | 8.93 | 1.001 | No |
| #2 | | Pre-Challenge | 18.957 | 18.949 | 0.001 | Yes |
| | | Post Challenge | 18.948 | 18.939 | 0.001 | Yes |
| #3 Cut Fiber | | Pre-Challenge | 18.89 | 9.48 | 0.941 | No |
| | | Post Challenge | 18.83 | 9.4 | 0.943 | No |
| #3 | | Pre-Challenge | 18.925 | 18.905 | 0.002 | Yes |
| | | Post Challenge | 18.923 | 18.91 | 0.001 | Yes |
| #4 | | Pre-Challenge | 19.098 | 19.095 | 0.000 | Yes |
| | | Post Challenge | 18.92 | 18.938 | -0.002 | Yes |
| #5 | | Pre-Challenge | 18.982 | 18.983 | 0.000 | Yes |
| | | Post Challenge | 18.978 | 18.991 | -0.001 | Yes |

[1] $D_{base}$ is the diffusive loss through a fully integral membrane module that may be measurable during integrity testing. For example, a theoretical $P_{test}$ may be determined using a formula, however, the starting test pressure may need to be higher to account for diffusive losses during the test to ensure that the pressures dictated by $P_{test}$ are met through the entire test duration (i.e. $P_{test}$ must be met at the end of the integrity test).

**Air to Liquid Conversion Ratio, ALCR**

The air-liquid conversion ratio (ALCR) is typically calculated for hollow-fiber membranes in one of two ways depending upon the flow regime (laminar or turbulent) that is anticipated with an integrity breach, and both methods are presented here (flat-sheet type membranes ALCR equations are similar except that under turbulent flow, the orifice model is used for determining the net expansion factor, Y - see the MFGM Chapter 4 and Appendix C. For process control ALCR should be calculated using the turbulent model.

**$ALCR_{Laminar}$**

In the case of laminar flow through a breach, ALCR is calculated using the Hagen-Poiseuille model as defined in Equation 7 (C.15 of the MFGM) as shown below:

**Equation 8 – $ALCR_{Laminar}$**

$$ALCR_{Laminar} = \frac{527 \times \Delta P_{eff} \times (175 - 2.71 \times T + 0.137 \times T^2)}{TMP \times (460 + T)}$$

where:
- ALCR = Air-liquid conversion ratio
- T = Feed water temperature (°F)
- TMP = Transmembrane pressure (psi)
- $\Delta P_{eff}$ = Effective integrity test pressure (psi)

$\Delta P_{eff}$ is calculated using Equation 8 (MFGM Equation C.12) as follows:

**Equation 9 – Effective Integrity Test Pressure**

$$\Delta P_{eff} = [P_{test} - BP] \times \left[\frac{(P_{test} + P_{atm}) + (BP + P_{atm})}{2 \times (BP + P_{atm})}\right] \times \left[\frac{(BP + P_{atm})}{P_{atm}}\right]$$

where:
- $P_{test}$ = Applied direct integrity test pressure (psi)
- BP = Backpressure on the system during a DIT (psi)
- Patm = Atmospheric pressure (psia)

**$ALCR_{Turbulent}$**

In the case of turbulent flow through a breach, the ALCR, "$ALCR_{Turbulent}$" is calculated using the Darcy Pipe Flow model as defined in Equation 9 (C.4 of the MFGM). Equation 9 as follows:

**Equation 10 – $ALCR_{Turbulent}$**

$$ALCR_{Turbulent} = 170 \times Y \times \sqrt{\frac{(P_{test} - BP)(P_{test} + P_{atm})}{((460 + T) \times TMP)}}$$

where:
- ALCR = air-liquid conversion ratio (dimensionless)
- Y = net expansion factor for compressible flow through a pipe to a larger area; per Crane Technical Paper 410 (p. A-22), the range for Y is 0.588 to 0.718 for isothermal flow
- $P_{test}$ = direct integrity test pressure (psi). If diffusion through an integral membrane unit (i.e., baseline pressure decay) was greater than 0 psi over the duration of the test, the baseline decay over the duration of the test would be subtracted from the initial test pressure before applying this parameter to Equation C.4. This practice yields a conservative result for ALCR.
- BP = backpressure on the system during the integrity test (psi)
- Patm = atmospheric pressure (psia)
- T = Feed water temperature (°F)
- TMP = Transmembrane pressure (psi)

Using the maximum anticipated backpressure ($BP_{max}$), maximum allowable TMP, maximum anticipated temperature, and a low net expansion factor (minimum of Y = 0.588, which is the lowest value from Crane) results in a lower value for ALCR and LRV, which is more conservative. When possible, calculating ALCR based on ambient conditions is recommended for determining $LRV_{Ambient}$. Table 18, below, shows the calculation of ALCR.

**Table 18 - Air-Liquid Conversion Ratio**

| Fixed Constants | | ALCR Equation |
|---|---|---|
| Y | 0.588 | $ALCR_{Turbulent} = 170 \times Y \times \sqrt{\frac{(P_{test} - BP)(P_{test} + P_{atm})}{((460 + T) \times TMP)}}$ |
| BP (psi) | 2.98 | |
| $P_{atm}$ (psi) | 14.7 | |

| Module ID | Test | Ending DIT Test Pressure (psi) | Water Temp (F) | TMP (psi) | ALCR | Average ALCR |
|---|---|---|---|---|---|---|
| #1 | Pre-Challenge | 18.93 | 61.0 | 18.29 | 23.72 | 23.82 |
| | Post Challenge | 18.96 | 61.0 | 18.03 | 23.92 | |
| #1 Poke Hole | Pre-Challenge | 18.38 | 71.5 | 15.77 | 24.64 | 24.26 |
| | Post Challenge | 18.38 | 71.5 | 16.77 | 23.89 | |
| #2 Cut Fiber | Pre-Challenge | 8.87 | 64.1 | 15.63 | 13.01 | 12.80 |
| | Post Challenge | 8.93 | 64.1 | 16.93 | 12.58 | |
| #2 | Pre-Challenge | 18.95 | 61.7 | 15.58 | 25.70 | 25.77 |
| | Post Challenge | 18.94 | 61.7 | 15.39 | 25.84 | |
| #3 Cut Fiber | Pre-Challenge | 9.48 | 64.1 | 17.31 | 13.16 | 12.83 |
| | Post Challenge | 9.40 | 64.1 | 18.87 | 12.50 | |
| #3 | Pre-Challenge | 18.91 | 69.9 | 15.86 | 25.22 | 24.92 |
| | Post Challenge | 18.91 | 69.9 | 16.67 | 24.61 | |
| #4 | Pre-Challenge | 19.10 | 66.1 | 15.77 | 25.61 | 24.90 |
| | Post Challenge | 18.94 | 66.1 | 17.43 | 24.18 | |
| #5 | Pre-Challenge | 18.98 | 66.5 | 15.19 | 25.95 | 25.21 |
| | Post Challenge | 18.99 | 66.5 | 17.09 | 24.47 | |

### $LRV_{DIT}$ – Direct Integrity Test Sensitivity

A log reduction value representing the sensitivity of the DITs conducted as part of the challenge study, represented by the expression "$LRV_{DIT}$" was determined. $LRV_{DIT}$ may be like the measured LRV for each module tested; however, the intent of this calculation is to quantify the sensitivity, expressed as an LRV, of the DIT conducted on each module in detecting a response from a 3 µm breach. The sensitivity of the DIT is dependent upon the applied pressure and the instrument sensitivity detecting the pressure. $LRV_{DIT}$ is represented by Equation 10 (4.9 of the MFGM), as follows:

**Equation 11 - $LRV_{DIT}$**

$$LRV_{DIT} = \log_{10}\left[\frac{Q_P \times ALCR \times P_{atm}}{\Delta P_{test} \times V_{sys} \times VCF}\right]$$

where:
- $Q_p$ = design flow rate in liters per minute
- ALCR = air-liquid conversion ratio
- $P_{atm}$ = atmospheric pressure in psia
- $\Delta P_{test}$ = smallest rate of pressure decay reliably measured & associated w/known integrity breach during the integrity test (psi/min); 0.01 psi/minute was used
- $V_{sys}$ = volume in liters (L) of pressurized air in the system during the test
- VCF = volumetric concentration factor and is 1 for deposition mode (no cross flow)

In this form, $LRV_{DIT}$ is the maximum removal value that the membrane integrity test is capable of verifying. The variables used are conservative to generate the lowest LRVDIT. If calculations using conservative values result in an $LRV_{DIT}$ that is greater than or equal to the log removal credit (LRC) desired for an application, then one can reasonably conclude that the membrane filter can meet the test sensitivity requirements under the LT2ESWTR.

### $LRV_{Ambient}$ – Current Conditions

For process optimization purposes, the same formula used to calculate $LRV_{DIT}$ shall be used to calculate a theoretical LRV based on current or "ambient" operating conditions during the challenge test using the actual DIT data. It is recommended that the equation for $LRV_{DIT}$ be used with a few modifications and distinguished from $LRV_{DIT}$ by the term "$LRV_{Ambient}$", with certain variables reflecting current operating conditions.

**Equation 12 - $LRV_{Ambient}$**

$$LRV_{Ambient} = \log_{10}\left[\frac{Q_P \times ALCR \times P_{atm}}{\Delta P_{test} \times V_{sys} \times VCF}\right]$$

where:
- $Q_p$ = observed flow rate in liters per minute
- ALCR = air-liquid conversion ratio
- $P_{atm}$ = atmospheric pressure in psia
- $\Delta P_{test}$ = the observed pressure decay rate in psi per minute from the last DIT
- $V_{sys}$ = volume in liters (L) of pressurized air in the system during the test
- VCF = volumetric concentration factor and is 1 for deposition mode (no cross flow)

Table 19 shows the calculation of both $LRV_{Ambient}$ and $LRV_{DIT}$. It is noted that the $LRV_{DIT}$ values are higher than the LRC typically desired in application, thus proving their adequacy for the sensitivity criteria under the LTS2ESWTR.

**Table 19 - $LRV_{Ambient}$ and $LRV_{DIT}$**

| Fixed Constants | | $LRV_{DIT}$ Equation[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| VCF | 1 | $LRV_{DIT} = \log_{10}\left[\frac{Q_p \times ALCR \times P_{atm}}{\Delta P_{test} \times V_{sys} \times VCF}\right]$ | | | | | | | |
| $V_{sys}$ (liters) | 34.0 | | | | | | | | |
| $P_{atm}$ (psi) | 14.7 | | | | | | | | |
| Design $Q_p$ (lpm) | 305.67 | | | | | | | | |
| Module ID | Test | $\Delta P_{test}$ (psi/min) | Ambient Flow Rate, $Q_p$ (lpm) | | | ALCR | $LRV_{Ambient}$ | $LRV_{DIT}$ | Mean $LRV_{Ambient}$ |
| | | | Initial | Final | Average | | | | |
| #1 | Pre-Challenge | 0.006 | 306.96 | 307.30 | 307.13 | 23.8 | 5.74 | 5.50 | 5.72 |
| | Post Challenge | 0.006 | 306.96 | 307.30 | 307.13 | 23.8 | 5.70 | 5.50 | |
| #1 Poked Hole | Pre-Challenge | 0.049 | 306.13 | 306.47 | 306.30 | 24.3 | 4.81 | 5.51 | 4.82 |
| | Post Challenge | 0.047 | 306.13 | 306.47 | 306.30 | 24.3 | 4.83 | 5.51 | |
| #2 Cut Fiber | Pre-Challenge | 0.998 | 303.29 | 307.34 | 305.31 | 12.8 | 3.23 | 5.23 | 3.23 |
| | Post Challenge | 1.001 | 303.29 | 307.34 | 305.31 | 12.8 | 3.23 | 5.23 | |
| #2 | Pre-Challenge | 0.001 | 305.94 | 306.31 | 306.13 | 25.8 | 6.63 | 5.53 | 6.60 |
| | Post Challenge | 0.001 | 305.94 | 306.31 | 306.13 | 25.8 | 6.58 | 5.53 | |
| #3 Cut Fiber | Pre-Challenge | 0.941 | 306.84 | 308.09 | 307.47 | 12.8 | 3.26 | 5.23 | 3.26 |
| | Post Challenge | 0.943 | 306.84 | 308.09 | 307.47 | 12.8 | 3.26 | 5.23 | |
| #3 | Pre-Challenge | 0.002 | 305.75 | 306.31 | 306.03 | 24.9 | 6.22 | 5.52 | 6.31 |
| | Post Challenge | 0.001 | 305.75 | 306.31 | 306.03 | 24.9 | 6.40 | 5.52 | |
| #4 | Pre-Challenge | 0.000 | 306.43 | 307.26 | 306.84 | 24.9 | 7.04 | 5.52 | 7.04 |
| | Post Challenge | -0.002 | 306.43 | 307.26 | 306.84 | 24.9 | - | 5.52 | |
| #5 | Pre-Challenge | 0.000 | 306.39 | 306.81 | 306.60 | 25.2 | - | 5.52 | - |
| | Post Challenge | -0.001 | 306.39 | 306.81 | 306.60 | 25.2 | - | 5.52 | |

[1]This equation shall be used for both $LRV_{DIT}$ and $LRV_{Ambient}$, however, $LRV_{DIT}$ shall be determined using the Design $Q_P$ while $LRV_{Ambient}$ shall be determined using the average ambient $Q_P$.

**Summary of NDPT and QCRV Determination**

The pre-test and post-test pressure decay test (PDT) results are displayed below in Table 20 for all modules tested. Additionally, the test rig plumbing was also pressure decay tested alone to check for any pressure loss from the plumbing. There was no significant pressure loss measured in the plumbing that was used for each test, thus no corrections to the observed decay rates were necessary.

**Table 20 - PDT Results**

| Module | Decay Rates (psi/min) | | | $LRV_{C\text{-}TEST}$ | Mean $LRV_{Ambient}$ |
|---|---|---|---|---|---|
| | Initial | Final | Average | | |
| #1 | 0.006 | 0.006 | 0.006 | 6.22 | 5.72 |
| #1 Poked Hole | 0.049 | 0.047 | 0.048 | 5.17 | 4.82 |
| #2 Cut Fiber | 0.998 | 1.001 | 1.000 | 3.57 | 3.23 |
| #2 | 0.001 | 0.001 | 0.001 | 6.15 | 6.60 |
| #3 Cut Fiber | 0.941 | 0.943 | 0.942 | 3.74 | 3.26 |
| #3 | 0.002 | 0.001 | 0.002 | 6.06 | 6.31 |
| #4 | 0.000 | -0.002 | -0.001 | 6.14 | 7.04 |
| #5 | 0.000 | -0.001 | -0.001 | 6.10 | - |

A relationship is expected between the $LRV_{C\text{-}Test}$ and $LRV_{Ambient}$. Additionally, there is an expected inverse relationship between the PDT and $LRV_{Ambient}$, as the PDT increases the $LRV_{Ambient}$ decreases. This relationship should also occur between the $LRV_{C\text{-}Test}$ and PDT. The $LRV_{C\text{-}Test}$ results for all five intact modules ranged from 6.06 to 6.22 $\log_{10}$, with PDT decay rates ranging only from 0.000 to 0.006 psi/min. As these LRV values fall within the standard error of the test (±0.20 log), and more importantly, such a small range of pressure decay rates were observed, insufficient data was collected to a strong correlation between the $LRV_{C\text{-}Test}$ and PDT decay rate. The $LRV_{C\text{-}Test}$ values for the modules with the poked hole and cut fibers were significantly lower on average and had a significantly higher PDT decay rates, which is consistent with the expected relationship, however, testing a larger number of compromised modules would be necessary to develop a robust statistical relationship specific to these modules.

Challenge testing is used to establish the LRV of an integral module of a product type; however, it does not necessarily guarantee that all such modules produced will achieve the same level of performance due to variability in the manufacturing process. To address this issue, a NDPT is applied to all subsequently manufactured modules that are not subject to challenge testing to ensure that these modules meet the performance established during challenge testing. The minimum passing test result for a NDPT is known as the quality control release value, QCRV. After a group of modules has been subjected to challenge testing, the NDPT is applied to those modules to determine an appropriate QCRV associated with the removal efficiency observed during the test. Subsequently, all modules that are not subjected to challenge testing must pass the same NDPT by exceeding the established QCRV applicable to *Cryptosporidium* removal under the LT2ESWTR. Modules that do not pass the NDPT at the QCRV would not be eligible for *Cryptosporidium* removal credit under the rule and could not be used in any membrane filtration systems applied for this purpose (40 CFR § 141.719(b)(2)(vii)).

Removing the cut fiber challenge test from consideration due to its extremely high pressure decay rate, and subsequently only observing the data from the five intact modules and the challenge test performed on the module with the poked hole, the average decay rates ranged from 0.000 psi/min to a maximum of 0.048 psi/min. A robust correlation was not developed between the $LRV_{C\text{-}Test}$ results as a function of pressure decay rates, and as such, any module possessing a pressure decay rate within the range observed during testing could be expected to achieve a similar $LRV_{C\text{-}Test}$ equal to the lowest observed from this group of modules (5.17 $\log_{10}$). As a result, the module with the highest observed average pressure decay rate was selected to set the QCRV for certification purposes, 0.048 psi/minute. Based on these results, the factory QCRV associated with the $LRV_{C\text{-}}$

$_{Test}$ of 5.17 $\log_{10}$ is set at the PDT decay rate of 0.048 psi/min. A summary of the membrane integrity information is shown below in Table 21.

**Table 21 - Membrane Integrity Summary Information**

| Revised NDPT method and QCRV | |
|---|---|
| NDPT method (e.g., pressure decay, etc.) | **10-minute pressure decay from 18.85 psi** |
| QCRV (include units) | **0.048 psi/min** |
| Equations for use in determining $LRV_{DIT}$, ALCR, and DIT pressures | |
| $LRV_{DIT}$ equation | $LRV_{DIT} = \log_{10}\left[\frac{Q_P \times ALCR \times P_{atm}}{\Delta P_{test} \times V_{sys} \times VCF}\right]$ |
| ALCR equation | $ALCR_{Turbulent} = 170 \times Y \times \sqrt{\frac{(P_{test} - BP)(P_{test} + P_{atm})}{((460 + T) \times TMP)}}$ |
| DIT pressure equation | $P_{test} = (0.193 \times K \times \sigma \times cos\theta) + BP_{max}$ |
| Constants for use in determining $LRV_{DIT}$, ALCR, and DIT pressures | |
| Volume of pressurized air in module during DIT (liters) | 34.0 |
| Volumetric concentration factor (VCF, dimensionless) | 1 |
| Net expansion factor (Y) | 0.588 |
| Lumen diameter (d, mm) | 1.1 outside, 0.7 inside |
| Potting depth or defect length (l, mm) | - |
| Pore shape correction factor (K, dimensionless) | 1 |
| Liquid membrane contact angle (ɵ, degrees) | 0° |
| Maximum design flow rate per module (L/min) | 305.67 |

*Note: The "revised" nondestructive performance test (NDPT) method and quality control release value (QCRV) are the NDPT and QCRV established as a result of the challenge study that will demonstrate meeting the 3 μ resolution requirement (with calculations and variables used) and that the modules will meet the removal efficiency demonstrated by the challenge test ($LRV_{C\text{-}Test}$). These may not have changed from what the manufacturer was already using, however, the term "revised" is used to denote the NDPT and QCRV reviewed/revised as a result of the challenge test.*

## References


1. US EPA, *Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) (40 CFR §141.719)*

2. US EPA, *Membrane Filtration Guidance Manual*, November 2005

3. Environmental Technology Verification (ETV), *Generic Protocol for the Product Specific Challenge Testing of Microfiltration or Ultrafiltration Membrane Modules*, May 2011

4. NSF/ANSI 419, *Public Drinking Water Equipment Performance – Filtration*

5. NSF/ANSI 61, *Drinking Water System Components – Health Effects*

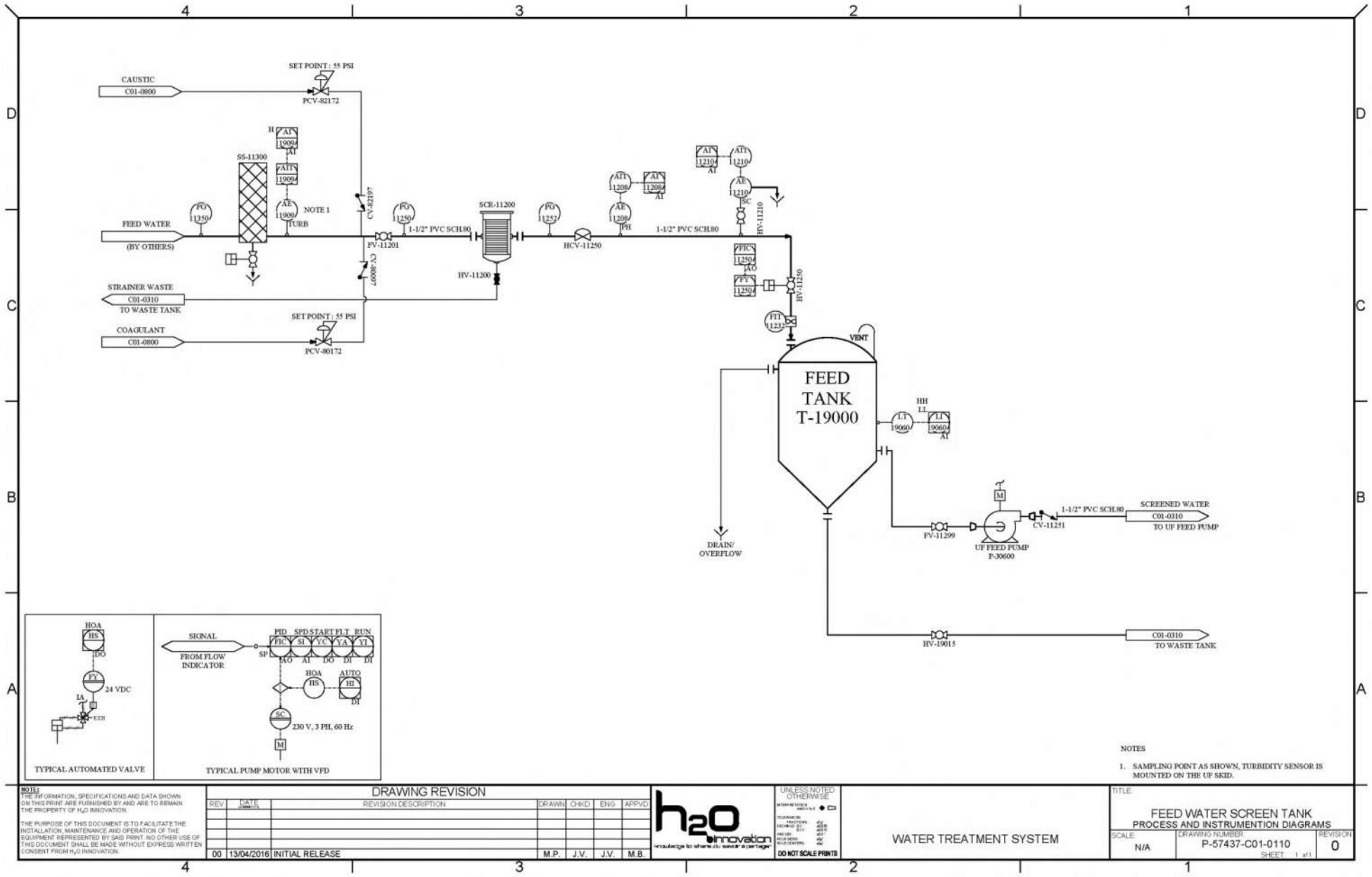
6. ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

7. Crane Co., Stamford, CT, *Technical Paper No. 410 Flow of fluids through valves, fittings, and pipe*, 1988

# APPENDIX K

# Pilot Unit P&ID

# (Envelope 1)




NOTES

1. SAMPLING POINT AS SHOWN, TURBIDITY SENSOR IS MOUNTED ON THE UF SKID.



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WATER TREATMENT SYSTEM

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FEED WATER SCREEN TANK
PROCESS AND INSTRUMENTION DIAGRAMS

| SCALE | DRAWING NUMBER | REVISION |
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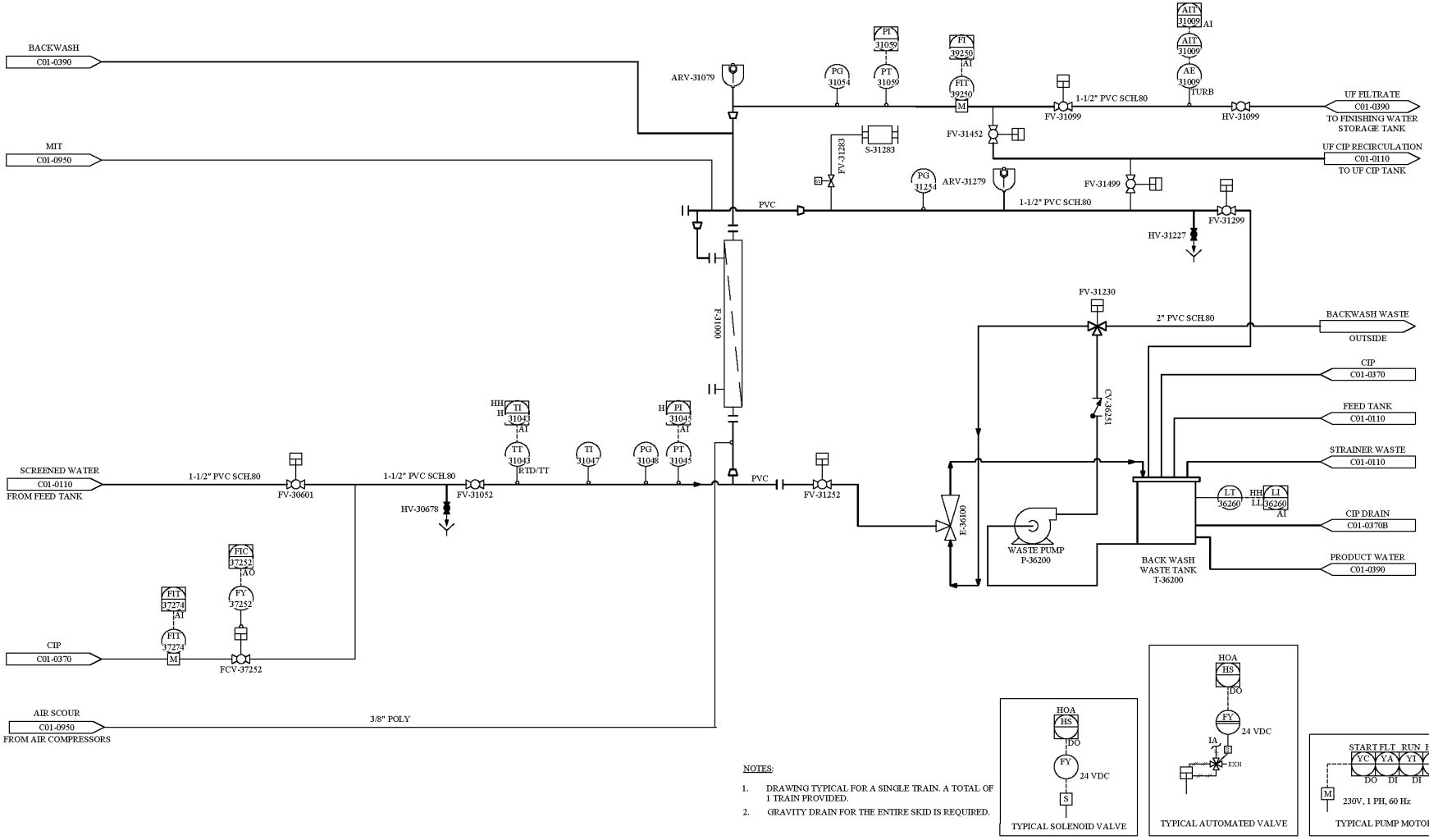
SHEET 1 of 1



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WATER TREATMENT SYSTEM

TITLE:
ULTRA FILTRATION UNIT
W/ FCV AND BLOCK & BLEED
PROCESS AND INSTRUMENTION DIAGRAMS

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| N/A | P-57437-C01-0310 | 0 |

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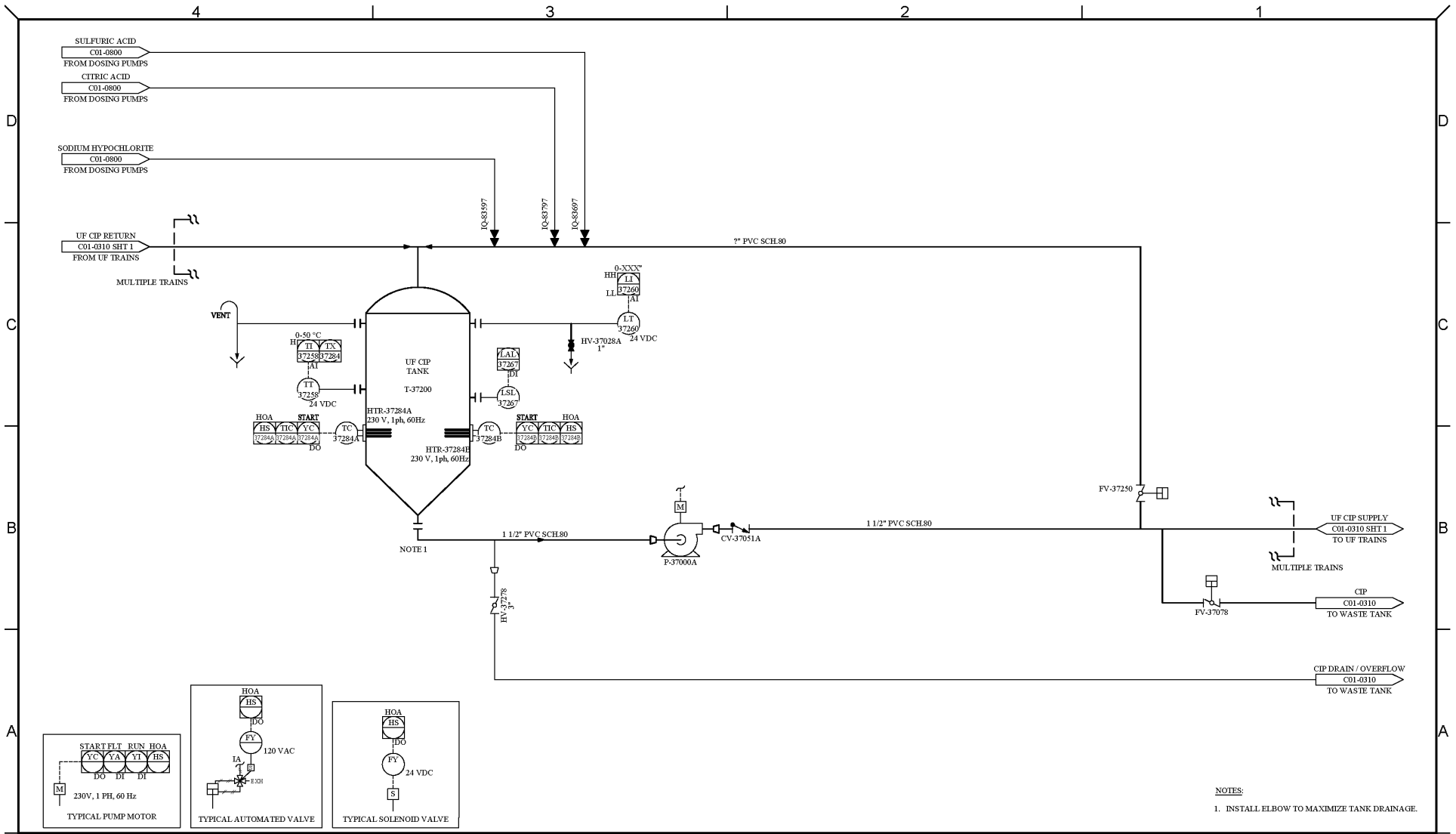


NOTES:

1. INSTALL ELBOW TO MAXIMIZE TANK DRAINAGE.



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INTERPRETATION: ANSI Y14.5
TOLERANCES: FRACTIONS: ±1/64 DECIMALS: 2 DO: ±0.005 3 DO: ±0.010 ANGLES: ±0.5° HOLE SIZES: ±0.2 HOLE CENTERS: ±0.2
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WATER TREATMENT SYSTEM

TITLE:
UF CIP SYSTEM
W/ VFD CONTROLLED PUMP
PROCESS & INSTRUMENTATION DIAGRAM

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| N/A | P-57437-C01-0370 | 00 |

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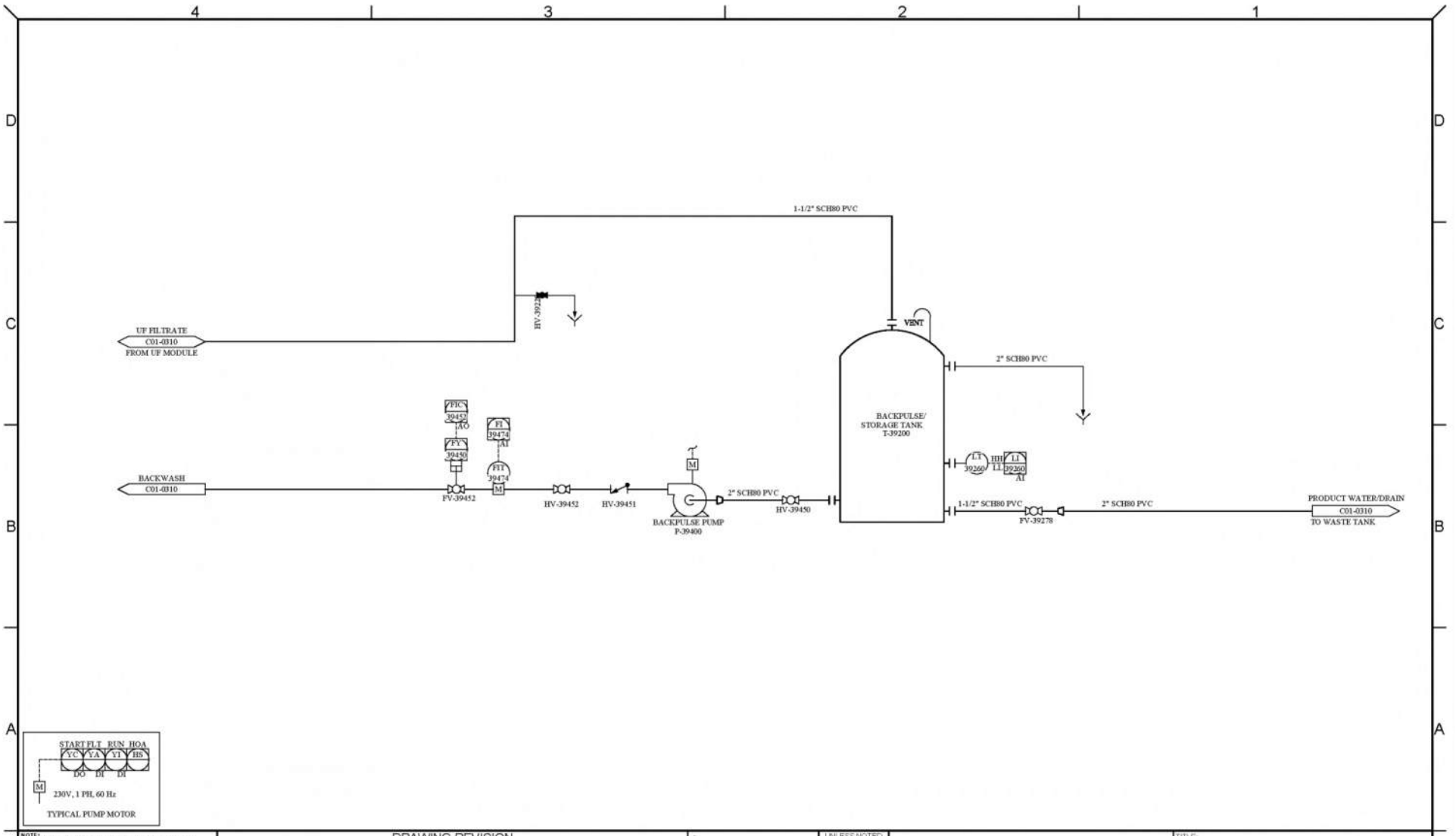


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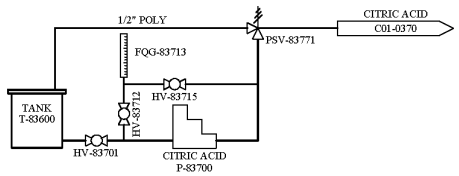


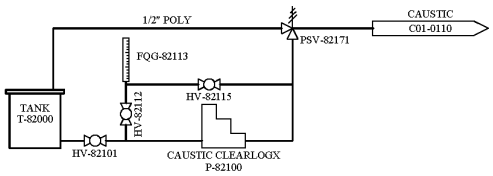


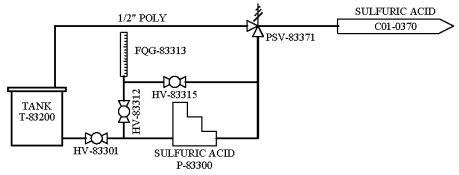


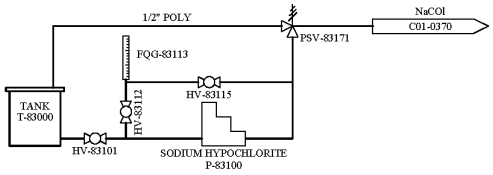


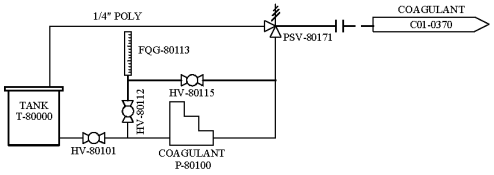


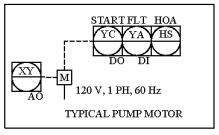




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# APPENDIX L

# Preliminary UF P&ID

# (Envelope 1)

# VALVE SYMBOLS

- BALL
- V BALL
- BUTTERFLY
- DIAPHRAGM
- KNIFEGATE GENERIC
- GLOBE
- NEEDLE
- PLUG
- CHECK
- ANGLE SEAT (PISTON)
- THREE-WAY BALL
- PRESSURE REGULATOR
- BACK PRESSURE REGULATOR
- 2-WAY SOLENOID
- DRAIN/SAMPLE
- VACUUM BREAKER
- AIR RELEASE
- AIR/VAC COMBO
- PRESSURE RELEASE
- MULTIFUNCTION
- CALIBRATION MANIFOLD
- SLUICE GATE/WEIR

# LINE SYMBOLOGY

- PIPING NOT BY H2O INNOV.
- MAIN PROCESS LINE
- COMM LINK (PLC)
- COMM LINK (DCS)
- ELECTRICAL WIRING
- PNEUMATIC LINE
- LINE JUMPER
- PIPE DISCONTINUATION
- 12 inch 316SS SCH 10 — LINE SIZE / MATERIAL IDENTIFIER
- SKID OR SCOPE BOUNDARY
- 1 — REVISION
- DESCRIPTION
- REF — DESTINATION — CONNECTION FLAG

# EQUIPMENT SYMBOLS

- PRESSURIZED UF MEMBRANE
- SUBMERGED MEMBRANE
- RO MEMBRANE
- CALIBRATION COLUMN
- STATIC MIXER
- SUBMERSIBLE MIXER
- IMMERSION HEATER
- COARSE BUBBLE DIFFUSER
- FINE BUBBLE DIFFUSER
- SOLENOID VALVE BLOCK
- CENTRIFUGAL PUMP
- CHEMICAL METERING PUMP
- ROTARY LOBE POSITIVE DISPLACEMENT PUMP
- SUBMERSIBLE PUMP
- PERISTALTIC PUMP
- DIAPHRAGM SEAL
- MOTOR
- PULSATION DAMPENER
- FLOWCELL
- REFRIGERATED DRYER
- PARTICULATE FILTER
- CARBON FILTER
- OIL WATER SEPARATOR
- DESSICANT DRYER
- BAG FILTER
- REGENERATIVE BLOWER
- POSITIVE DISPLACEMENT BLOWER
- PISTON COMPRESSOR
- ROTARY SCREW COMPRESSOR
- RUPTURE DISC
- CARTRIDGE FILTER HOUSING
- AUTOMATIC STRAINER
- INLINE WYE STRAINER
- INLINE CONICAL STRAINER
- BASKET STRAINER
- BAR SCREEN
- VENT FILTER
- BLOWER FILTER
- SILENCER
- UV REACTOR
- EJECTOR / EDUCTOR
- SPRAY NOZZLE
- INJECTION QUILL
- FLOW ORIFICE
- INSIDE / OUTSIDE — LOCATION
- VERTICAL TURBINE PUMP
- AIR DIAPHRAGM PUMP
- BUBBLE TRAP
- ROTARY DRUM SCREEN
- SOLIDS COMPACTOR
- SCREW SCREEN AND COMPACTOR
- MULTIMEDIA FILTERS / GRANULATED ACTIVATED CARBON FILTERS
- BLADDER TANK
- CHEMICAL DAY TANK
- TANK SECONDARY CONTAINMENT
- PROCESS TANK

# CONTROLS SYMBOLS

- LOCALLY MOUNTED DISCRETE INSTRUMENT
- PANEL MOUNTED INSTRUMENT
- PRIMARY PLC / DCS SHARED CONTROL
- SECONDARY PLC / DCS SHARED CONTROL
- COMPUTER FUNCTION
- CL — CONTROL LOOP FLAG CL = F, L, P, ETC

# INSTRUMENTATION SYMBOLS

- FI — ROTAMETER
- FI — ROTAMETER WITH NEEDLE VALVE
- FIT — THERMAL FLOWMETER
- FIT — PADDLEWHEEL FLOWMETER
- ULTRASONIC LEVEL
- LEVEL FLOAT SWITCH
- FIT M — MAGNETIC FLOWMETER
- FIT — VORTEX FLOWMETER
- RADAR LEVEL
- FIT — DIFFERENTIAL PRESSURE FLOWMETER

# VALVE ACTUATOR SYMBOLS

- PNEUMATIC ACTUATOR
- ELECTRIC ACTUATOR
- DIAPHRAGM
- PNEUMATIC ACTUATOR WITH SPRING

# PIPING SYMBOLS

- FLANGE
- THREADED CONNECTION
- THREAD TO TUBING
- UNION
- TRICLAMP / SANITARY
- BLIND FLANGE
- CAPPED END
- REDUCER
- SLOPED PIPING
- DRAIN
- VENT
- HOSE / TUBING
- QUICK DISCONNECT
- FLEXIBLE CONNECTION
- GROOVED COUPLING
- DOUBLE CONTAINMENT
- X" INSULATION THICKNESS — INSULATION
- X" INSULATION THICKNESS, E — HEAT TRACING (E=ELECTRIC, G=GLYCOL, S=STEAM)
- MULTIPLE TRAINS
- SS / PVC — SPECIFICATION BREAK

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OF 17
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## FLOW INSTRUMENTS

| | |
|---|---|
| FAH | FLOW ALARM HIGH |
| FAL | FLOW ALARM LOW |
| FCV | FLOW CONTROL VALVE |
| FE | FLOW ELEMENT |
| FI | FLOW INDICATOR |
| FIC | FLOW INDICATING CONTROLLER |
| FIT | FLOW INDICATING TRANSMITTER |
| FSH | FLOW SWITCH HIGH |
| FSL | FLOW SWITCH LOW |
| FV | FLOW CONTROL OR ON/OFF VALVE |
| FQ | FLOW TOTALIZER |
| FY | FLOW SIGNAL CONVERT, I/P, SOLENOID |

## PRESSURE INSTRUMENTS

| | |
|---|---|
| PAH | PRESSURE ALARM HIGH |
| PAL | PRESSURE ALARM LOW |
| PC | PRESSURE CONTROLLER |
| PCV | PRESS CONTROL VALVE |
| PDH | DIFFERENTIAL PRESSURE HIGH |
| PDI | DIFFERENTIAL PRESSURE INDICATOR |
| PDIT | DIFF PRESS INDICATING TRANSMITTER |
| PG | PRESSURE GAUGE |
| PIC | PRESSURE INDICATING CONTROLLER |
| PIT | PRESSURE INDICATING TRANSMITTER |
| PSH | PRESSURE SWITCH HIGH |
| PSL | PRESSURE SWITCH LOW |
| PSV | PRESSURE SAFETY VALVE |
| PT | PRESSURE TRANSMITTER |
| PY | PRESS SIGNAL CONVERT, I/P, SOLENOID |
| PSL | PRESSURE SWITCH LOW |
| PSH | PRESSURE SWITCH HIGH |
| VSV | VACUUM SAFETY VALVE |

## LEVEL INSTRUMENTS

| | |
|---|---|
| LAH | LEVEL ALARM HIGH |
| LAL | LEVEL ALARM LOW |
| LCV | SELF REG LEVEL CONTROL VALVE |
| LE | LEVEL ELEMENT |
| LG | LEVEL GAUGE |
| LI | LEVEL INDICATOR |
| LIC | LEVEL INDICATING CONTROLLER |
| LIT | LEVEL INDICATING TRANSMITTER |
| LSH | LEVEL SWITCH HIGH |
| LSL | LEVEL SWITCH LOW |
| LT | LEVEL TRANSMITTER |
| LV | LEVEL CONTROL OR ON/OFF VALVE |
| LY | LEVEL SIGNAL CONVERT, I/P, SOLENOID |

## TEMPERATURE INSTRUMENTS

| | |
|---|---|
| TAH | TEMPERATURE ALARM HIGH |
| TAL | TEMPERATURE ALARM LOW |
| TC | TEMPERATURE CONTROLLER |
| TE | TEMPERATURE ELEMENT |
| TG | TEMPERATURE GAUGE |
| TI | TEMPERATURE INDICATOR |
| TIC | TEMP INDICATING CONTROLLER |
| TIT | TEMP INDICATING TRANSMITTER |
| TSH | TEMPERATURE SWITCH HIGH |
| TSL | TEMPERATURE SWITCH LOW |
| TT | TEMPERATURE TRANSMITTER |
| TV | TEMP CONTROL OR ON/OFF VALVE |
| TY | TEMP SIGNAL CONVERT, I/P, OR SOLN |

## ELECTRICAL ABBREVIATIONS

| | |
|---|---|
| AI | ANALOG IN |
| AO | ANALOG OUT |
| DI | DIGITAL IN |
| DO | DIGITAL OUT |
| JB | JUNCTION BOX |
| MCP | MAIN CONTROL PANEL |
| RIO | REMOTE I/O PANEL |
| PP | POWER PANEL |
| VFD | VARIABLE FREQUENCY DRIVE |
| HOA | HAND-OFF-AUTO |

## ANALYTICAL INSTRUMENTS

| | |
|---|---|
| AAH | ANALYTICAL ALARM HIGH |
| AAL | ANALYTICAL ALARM LOW |
| AE | ANALYTICAL ELEMENT |
| AI | ANALYTICAL INDICATOR |
| AIC | ANAL INDICATING CONTROLLER |
| AIT | ANAL INDICATING TRANSMITTER |
| ASH | ANALYTICAL SWITCH HIGH |
| ASL | ANALYTICAL SWITCH LOW |
| AT | ANALYTICAL TRANSMITTER |
| AY | AN. SIGNAL CONVERTER, I/P, SOLENOID |

## MISCELLANEOUS INSTRUMENTS

| | |
|---|---|
| HS | HAND SWITCH |
| HI | HAND SWITCH POSITION INDICATOR |
| II | CURENT INDICATOR |
| QQI | TOTALIZER INDICATOR |
| SC | SPEED CONTROLLER |
| SI | SPEED INDICATOR |
| YA | MOTOR ALARM |
| YC | MOTOR CONTROL |
| YI | MOTOR ON/OFF INDICATOR |
| ZI | POSITION INDICATOR |
| ZIC | SWITCH CLOSE INDICATOR |
| ZIO | SWITCH OPEN INDICATOR |
| ZSC | POSITION SWITCH CLOSED |
| ZSO | POSITION SWITCH OPEN |
| ZT | POSITION TRANSMITTER |
| ZY | POSITIONER |

## VALVES AND EQUIPMENT

| | |
|---|---|
| AC | AIR COMPRESSOR |
| ARV | AIR RELEASE VALVE |
| B | BLOWER |
| CBD | COARSE BUBBLE DIFFUSER |
| CV | CHECK VALVE |
| EJ | EJECTOR |
| F | FILTER |
| FBD | FINE BUBBLE DIFFUSER |
| FL | FAIL LAST (DEFAULT IF NOT SHOWN) |
| FC | FAIL CLOSED |
| FO | FAIL OPEN |
| FQG | CALIBRATION COLUMN |
| HCV | HAND CONTROL VALVE |
| HTR | HEATER |
| HV | HAND VALVE |
| IQ | INJECTION QULL |
| M | MOTOR |
| MX | MIXER |
| P | PUMP |
| RT | RESIN TRAP |
| SCR | SCREEN |
| ST | SPILL TANK |
| STR | STRAINER |
| T | TANK |
| UV | ULTRAVIOLET |
| MFV | MULTI FUNCTION VALVE |

## OTHER ABBREVIATIONS

| | |
|---|---|
| CAP | CAPACITANCE |
| CIP | CLEAN-IN-PLACE |
| COND | CONDUCTIVITY |
| DO2 | DISSOLVED OXYGEN |
| ESP | EMERGENCY STOP |
| IA | INSTRUMENT AIR |
| I/P | CURRENT TO PNEUMATIC CONVERTER |
| ORP | OXIDATION REDUCTION POTENTIAL |
| pH | HYDROGEN ION |
| RES | RESISTIVITY |
| RTD | RESISTANCE TEMP DETECTOR |
| SP | SET POINT |
| uS | MICROSIEMENS |

## PIPING ABBREVIATIONS

| | |
|---|---|
| 316SS | 316 STAINLESS STEEL |
| 304SS | 304 STAINLESS STEEL |
| CI | CAST IRON |
| CLCS | CEMENT LINED CARBON STEEL |
| CPVC | CHLORINATED POLYVINYL CHLORIDE |
| CS | CARBON STEEL |
| DI | DUCTILE IRON |
| HDPE | HIGH-DENSITY PE |
| PE | POLYETHYLENE |
| PVC | POLYVINYL CHLORIDE |
| RLCS | RUBBER LINED CARBON STEEL |
| SCH | SCHEDULE |
| SDR | STANDARD DIMENSION RATIO |

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CFBUF06 - C01 - 0002

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CONTAINERIZED EQUIPMENT BY H2O INNOVATION

AIR TEMP T I CONT1 HH LL TT CONT1

LEAK L AH CONT1 HH DI LS CONT

SMOKE A AH CONT1 HH DI AS CONT1

NOTE 7

O/C Y C 30224.T HOA H S 30224.T

FY 30224.T

24 VDC

FV 30224.T

0-10 GPH FI 30232.T

AE 30209.T

SIGNAL AA 0310 TO UF TRAIN TRANSMITTER

CROSSFLOW RECIRCULATION R 0310 FROM UF MODULES

3 inch PVC SCH 80

1/2 inch PE TUBING

PID S C 30000.T SPD S I 30000.T START Y C 30000.T FLT Y A 30000.T RUN Y I 30000.T HOA H S 30000.T

P 30529.T 0300

SC 30000

480 VAC, 3 PH, 60 HZ

0-90 PSIG P I 30045.T

PT 30045.T 24 VDC

PVC SS

8 inch 316SS SCH10

5 inch 316SS SCH 10

P 30000.T FEED PUMP

4 inch PVC SCH 80

PE PVC

O/C Y C 30250A.T HOA H S 30250A.T

FY 30250A.T

FV 30250A.T

LOW Z IL 30200.T HIGH Z IH 30200.T

ZSL 30200.T ZSH 30200.T

FLT Y A 30200.T RUN Y I 30200.T FWD Y CF 30200.T REV Y CR 30200.T HOA H S 30200.T

DI DI DO DO

0-90 PSIG P I 30245.T

PT 30245.T 24 VDC

0-60 PSIG PG 30248.T

480 VAC, 3 PH, 60 HZ

0-60 PSIG PG 30254.T

0-90 PSIG P I 30259.T

P 30529.T 0300

PT 30259.T 24 VDC

NOTE 2

8 inch PVC SCH 80

STRAINED WATER B 0310 TO UF TRAINS

UF FEED WATER A NOT BY H2O INNOVATION 1000 GPM INSTANTANEOUS FLOW 5 PSIG MINIMUM INLET PRESSURE

NOTE 4

NOTE 5

8 inch 316SS SCH10

HV 30201.T

8 inch PVC SCH 80

STR 30200.T UF STRAINER 200 MICRON

FV 30278.T

O/C Y C 30278.T HOA H S 30278.T

FY 30278.T

O/C Y C 30250C.T HOA H S 30250C.T

FY 30250C.T

FV 30250C.T

2 inch PVC SCH 80

STRAINER WASTE P 0310 TO DRAIN

2 inch PVC SCH 80

WASTE T 0310 TO BLEED DRAIN HEADER

NOTES :

1.EQUIPMENT, PIPING AND WIRING COMPLETED BY H2O INNOVATION ONLY WHERE INDICATED BY CONTAINER BOUNDARIES.
2. FCV AND PRESSURE TRANSMITTER USED TO CONTROL FEED PRESSURE SETPOINT.
3. DRAWING IS TYPICAL FOR A SINGLE UF TRAIN. A TOTAL OF 3 TRAINS PROVIDED (2 IN CONTAINER #1 AND 1 IN CONTAINER #2.
4. INDIVIDUAL FEED WATER CONNECTION REQUIRED FOR EACH UF TRAIN. A TOTAL OF TWO CONNECTION IS REQUIRED TO OPERATE TRAINS AT FULL CAPACITY.
5. BACKFLOW PREVENTION REQUIRED ON FEED WATER SUPPLY.
6. COMMUNICATION SIGNALS FOR INSTRUMENTS TO BE WIRED TO SOLENOID I/O CARDS TO SIMPLIFY SYSTEM WIRING. SOLENOID I/O CARDS WILL CONNECT TO CONTROL PANEL VIA ETHERNET.
7. SMOKE DETECTOR, AMBIENT TEMPERATURE TRANSMITTER, AND LEAK DETECTION.

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| 00 | JAN 09, 2024 | ISSUED FOR CONSTRUCTION | BK | BK | MH |



# FLEXBOX_UF_06
## RENTAL EQUIPMENT
## 1700 GPM

TITLE :

## UF STRAINER
## PIPING & INSTRUMENTATION DIAGRAM
CFBUF06 - C01 - 0300

NOT BY H2O INNOVATION | CONTAINERIZED EQUIPMENT BY H2O INNOVATION

BACKPULSE WATER
D 0360
FROM BACKWASH PUMP

FV 31201.T (O/C HOA YC 31201.T HS 31201.T; FY 31201.T)

8 inch HDPE DR17

FV 31227.T (O/C HOA YC 31227.T HS 31227.T; FY 31227.T; S 24 VDC)

1/2 inch PE TUBING

8 inch PVC SCH 80

UF FILTRATE
C 0360
TO BACKPULSE TANK AND END USE

FV 31099B.T (O/C HOA YC 31099B.T HS 31099B.T; FY 31099B.T)

FV 31099C.T (O/C HOA YC 31099C.T HS 31099C.T; FY 31099C.T)

FEED TURBIDITY SIGNAL
AA 0300
FROM FEED TURBIDITY METER

AIT 31089.T (0-1000 mNTU 300/100 AI 31089.T HH H; 0-500 NTU 300/100 AI 30209.T HH H; 32-100 °F TI 30209.T; 24 VDC)

AE 31089.T

FV 31088.T (O/C HOA YC 31088.T HS 31088.T; FY 31088.T; S 24 VDC)

FI 31074.T (0-10 GPH)

1/2 inch PE TUBING

FV 31099A.T (O/C HOA YC 31099A.T HS 31099A.T; FY 31099A.T)

FV 31401A.T (O/C HOA YC 31401A.T HS 31401A.T; FY 31401A.T)

UF CIP SUPPLY/RINSE
Z 0370
TO/FROM CIP TANK

FV 31452.T (O/C HOA YC 31452.T HS 31452.T; FY 31452.T)

6 inch PVC SCH 80

CIP RETURN
G 0370
TO CIP TANK

FV 31499B.T (O/C HOA YC 31499B.T HS 31499B.T; FY 31499B.T)

FV 31499C.T (O/C HOA YC 31499C.T HS 31499C.T; FY 31499C.T)

31499A.T

FV 31499A.T (O/C HOA YC 31499A.T HS 31499A.T; FY 31499A.T)

0-90 PSIG 40 PI 31059.T HH
0-60 PSIG PG 31054.T
PT 31059.T (24 VDC)

PVC HDPE

8 inch HDPE DR17

HDPE SS

8 inch HDPE DR17

2 inch PVC SCH 40

2 inch HDPE DR17

FV 31401B.T (O/C HOA YC 31401B.T HS 31401B.T; FY 31401B.T)

FV 31401C.T (O/C HOA YC 31401C.T HS 31401C.T; FY 31401C.T)

6 inch 316SS SCH10

2 inch 316SS SCH10 S 31280.T CV 31251.T

FV 31251.T (O/C HOA YC 31251.T HS 31251.T; FY 31251.T)

PID HOA F 31274.T 0310 (FIC 31276.T HS 31276.T)

0-200 GPM FI 31274.T F 31274.T 0310 ZY 31276.T

FIT 31274.T (24 VDC) M

CROSSFLOW RECIRCULATION
R 0300
TO FEED PUMP

FCV 31276.T CV 31253.T

INSTRUMENT AIR
U UTIL 0950
FROM AIR COMPRESSOR

HV 31095.T

1/2 inch PE TUBING

HV 31096.T

S — UF TRAIN AND STRAINER SOLENOID AND I/O BLOCK 20 SOLENOIDS & 2 SPARES FV 31000.T

0-90 PSIG 40 PI 31045.T HH
PT 31045.T (0-60 PSIG; 24 VDC)
PG 31048.T

8 inch 316SS SCH10

0-1500 GPM 50 FI 31032.T LL F 31032.T 0310

PID HOA F 31032.T 0310 (FIC 31001.T HS 31001.T; ZY 31001.T)

FIT 31032.T (24 VDC) M

STRAINED WATER
B 0300
FROM PRETREATMENT

8 inch PVC SCH 80

FCV 31001.T

HV 30077.T

FV 31001C.T (O/C HOA YC 31001C.T HS 31001C.T; FY 31001C.T)

FV 31801.T (O/C HOA YC 31801.T HS 31801.T; FY 31801.T)

F 31000.T
ULTRA FILTRATION MODULES
34 MODULES PER TRAIN

3 inch 316SS SCH10

8 inch 316SS SCH10

3/4 inch PE TUBING

8 inch 316SS SCH10

PID HOA P IC 31078.T HS 31078.T; ZY 31078.T

FCV 31078.T

1/2 inch TUBING

1 inch PVC SCH 80 | 1 inch PVC SCH 80 | 1 inch PVC SCH 80

8 inch 316SS SCH10

UF BACKWASH WASTE
Q
TO DRAIN
NOTE 5
NOTE 4

8 inch PVC SCH 80

UF DRAINDOWN WASTE
Q1
TO DRAIN

8 inch 316SS SCH10

DRAINS
Q2
TO DRAIN
NOTE 3

2 inch 316SS SCH10

FV 31299A.T (O/C HOA YC 31299A.T HS 31299A.T; FY 31299A.T)

FV 31299C.T (O/C HOA YC 31299C.T HS 31299C.T; FY 31299C.T)

FV 31299B.T (O/C HOA YC 31299B.T HS 31299B.T; FY 31299B.T)

MIT AIR
V UTIL 0950
FROM AIR COMPRESSOR

2 inch 316SS SCH10

1 inch PVC SCH 80 | 1 inch PVC SCH 80

FV 31601.T (O/C HOA YC 31601.T HS 31601.T; FY 31601.T)

AIR SCOUR
S UTIL 0950
FROM AIR COMPRESSOR

3 inch 316SS SCH10

CV 31651.T

4 inch 316SS SCH10

PE TUBE SS

2 inch PVC SCH 80

STRAINER WASTE
P 0300
FROM STRAINER

STRAINER WASTE
T 0300
FROM STRAINER

1 inch PVC SCH 80

NOTES :

1. DRAWING TYPICAL FOR A SINGLE TRAIN. A TOTAL OF 3 TRAINS PROVIDED (2 IN CONTAINER #1 AND 1 IN CONTAINER #2.
2. EQUIPMENT, PIPING AND WIRING COMPLETED BY H2O INNOVATION ONLY WHERE INDICATED BY CONTAINER BOUNDARIES.
3. AIR GAP REQUIRED ON DRAIN LINE OF EACH TRAIN.
4. GRAVITY DRAIN WITH ZERO BACKPRESSURE REQUIRED FOR CONTAINER.
5. DRAIN LINES Q AND Q1 CAN BE CONNECTED OUTSIDE OF THE CONTAINER TO CIMPLIFY INTERCONNECTING PIPING.

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| 00 | JAN 09, 2024 | ISSUED FOR CONSTRUCTION | BK | BK | MH |



# FLEXBOX_UF_06
## RENTAL EQUIPMENT
1700 GPM

TITLE :
ULTRA-FILTRATION MODULES
PIPING & INSTRUMENTATION DIAGRAM
CFBUF06 - C01 - 0310

NOT BY H2O INNOVATION

CONTAINERIZED EQUIPMENT BY H2O INNOVATION

FILTRATE
C 0310
FROM UF RACKS

10 inch
PVC SCH 80

0-150 °F
100 TI HH
36058
TT 36058 24 VDC

PID HOA
FIC HS
36099 36099
ZY 36099
FCV 36099

CV 36053

FILTRATE
F
TO END USE

3 inch
PVC SCH 80

O/C HOA
YC HS
36050 36050
FY 36050
FV 36050

1/2 inch
PE TUBING

NOTE 3

HOUSE WATER SUPPLY
W1
NOT BY H2O INNOVATION

2 inch
316SS SCH10

NOTE 2

4 inch
316SS SCH10

0-15 FT
15 LI HH
1 36260 LL
LT 36260 24 VDC

F 36074
0360

PID SPD START FLT RUN HOA
SC SI YC YA YI HS
36000 36000 36000 36000 36000 36000

LAL
36267
LSL 36267

HV 36278

NOTE 3

SC 36000
M 480 VAC, 3 PH, 60 HZ

0-60 PSIG
PG 36054

0-2000 GPM
150 FI LL
36074
F 36074
0360

FIT 36074 24 VDC
M

8 inch
PVC SCH80

BACKPULSE WATER
D 0310
TO UF TRAINS

CV 36051

HV 36052

TK 36200
BACKPULSE SUPPLY TANK
1500 USGAL

P 36000
BACKPULSE PUMP

COMPRESSED AIR
W UTIL 0950
FROM AIR COMPRESSORS

1/2 inch
PE TUBING

S
UF CIP AND BACKPULSE SOLENOID BLOCK
7 SOLENOIDS & 3 SPARES
FV 36000

HV 36096

TANK OVERFLOW
E
TO DRAIN

NOTES :

1. EQUIPMENT, PIPING AND WIRING COMPLETED BY H2O INNOVATION ONLY WHERE INDICATED BY CONTAINER BOUNDARIES.
2. AUXILIARY NOZZLE FOR HOUSE WATER SUPPLY TO BACKPULSE TANK.
3. DRAIN CONNECTION IS CAPPED WITH A GROOVED COUPLING.
4. DRAWING IS TYPICAL FOR EACH CONTAINER.

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| 00 | JAN 09, 2024 | ISSUED FOR CONSTRUCTION | BK | BK | MH |



# FLEXBOX_UF_06
## RENTAL EQUIPMENT
## 1700 GPM

TITLE :
UF BACKPULSE SYSTEM
PIPING & INSTRUMENTATION DIAGRAM
CFBUF06 - C01 - 0360

NOT BY H2O INNOVATION

CONTAINERIZED EQUIPMENT BY H2O INNOVATION

CITRIC ACID
L 0830.3
FROM DOSING SKID

SODIUM HYPOCHLORITE
K 0830.1
FROM DOSING SKID

SODIUM BISULFITE
N 0840.1
FROM DOSING SKID

SODIUM HYDROXIDE
O 0840.2
FROM DOSING SKID

3/4 inch PE TUBING

IQ 84397 IQ 84197 IQ 83197 IQ 83797

O/C HOA
YC 37250 HS 37250
FY 37250
FV 37250

UF CIP RETURN
G 0310
FROM UF TRAINS

6 inch PVC SCH80

HOUSE WATER SUPPLY
W2
NOT BY H2O INNOVATION

NOTE 2
2 inch 316SS SCH10

NOTE 3

4 inch 316SS SCH10

HOA START
HS 37284 YC 37284
DO

TSH 37284

HTR 37284
480 VAC, 3 PH, 60 HZ
UF CIP TANK IMMERSION HEATER

HV 37278

NOTE 3

TK 37200
UF CIP TANK
1200 USGAL

0-150 °F
100 TI 37258 HH
TT 37258 24 VDC

0-15 FT
15 LI 37260 HH
2 L
1 LL
LT 37260 24 VDC

LSL 37267 LAL 37267

PID SPD START FLT RUN HOA
F 37074 0370
SC 37200 SI 37200 YC 37200 YA 37200 YI 37200 HS 37200

SC 37200
480 VAC, 3 PH, 60 HZ
M
P 37200
CIP PUMP

0-60 PSIG
PG 37054

6 inch PVC SCH80
PVC PE TUBE

PVC PE TUBE
CV 37051
HV 37052

0-14 AI 37090
-1500 - 1500 mV AI 37090
AIT 37090 24 VDC
AE 37090 pH/ORP
FE 37094

1/2 inch PE TUBING

CV 37049

1/2 inch PE TUBING

0-800 GPM
3 FI 37074 LL
F 37074 0370
FIT 37074 24 VDC
M

4 inch PVC SCH80

O/C HOA
YC 37299 HS 37299
FY 37299
FV 37299

4 inch PVC SCH80

NEUTRALIZED CIP WASTE
H
TO DISCHARGE

CIP SUPPLY/RINSE
Z 0310
TO/FROM UF TRAINS

CIP TANK OVERFLOW/DRAIN
J
TO DRAIN

NOTES:

1. EQUIPMENT, PIPING AND WIRING COMPLETED BY H2O INNOVATION ONLY WHERE INDICATED BY CONTAINER BOUNDARIES.
2. AUXILIARY NOZZLE FOR HOUSE WATER SUPPLY TO CIP TANK.
3. DRAIN CONNECTION IS CAPPED WITH A GROOVED COUPLING.
4. DRAWING IS TYPICAL FOR EACH CONTAINER

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
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# FLEXBOX_UF_06
## RENTAL EQUIPMENT
1700 GPM

TITLE :
UF CIP SYSTEM
PIPING & INSTRUMENTATION DIAGRAM
CFBUF06 - C01 - 0370



778

NOT BY H2O INNOVATION

CONTAINERIZED EQUIPMENT BY H2O INNOVATION

ACOUSTIC ENCLOSURE

480 VAC, 3 PH, 60 HZ M

F 95100
HIGH EFFICIENCY FILTER

AC 95000
OIL-FREE SCROLL COMPRESSOR

1 inch
316SS SCH10

M 120 VAC, 1 PH, 60 HZ

DR 95100
REFRIDGERATED DRYER

1 inch
316SS SCH10

NOTE 2
HV 95131

PSV 95235
SET POINT 150 PSIG

T 95200
AIR RECEIVER
240 GAL

0-160 PSIG
PG
95254

1-1/2 inch
316SS SCH10

HV 95152

1-1/2 inch
316SS SCH10

0-200 PSIG
150
100
PI
95845
H
LL

PT
95845
24 VDC

F 95300
COALESCING AND PARTICULATE FILTER
1 MICRON

HV 95351

HV 95352

HV 95801

1 inch
316SS SCH10

0-160 PSIG
PG
95848

PSV 95835
SET POINT 110 PSIG

PCV 95834
SET POINT 90 PSIG

HV 95878

HV 95899A

3/4 inch
316SS SCH10

HV 95899B

INSTRUMENT AIR
C1 UF 0830.1
TO AIR DIAPHRAGM PUMP

INSTRUMENT AIR
C2 UF 0830.2
TO AIR DIAPHRAGM PUMP

INSTRUMENT AIR
C3 UF 0830.3
TO AIR DIAPHRAGM PUMP

INSTRUMENT AIR
C4 UF 0840.1
TO AIR DIAPHRAGM PUMP

1/2 inch
316SS SCH10

INSTRUMENT AIR
C5 UF 0840.2
TO AIR DIAPHRAGM PUMP

INSTRUMENT AIR
W UF 0360
TO CIP/BW

INSTRUMENT AIR
U UF 0310
TO UF TRAINS

FV 95200 NOTE 1

HV 95378

1-1/2 inch
316SS SCH10

HV 95325

HV 95678

HV 95501

PCV 95734
SET POINT 110 PSI

0-30 PSIG
PG
95748

1-1/2 inch
316SS SCH10

HV 95778

PCV 31872
SET POINT 18 PSI

2 inch
316SS SCH10

PSV 31835
SP: 25 PSIG

HV 31878

MIT AIR
V UF 0310
TO UF TRAINS

1-1/2 inch
316SS SCH10

PSV 31635
SP: 25 PSIG

30-470 SCFM
FI
31632

PCV 31672
SET POINT 15 PSI

3 inch
316SS SCH10

BACKWASH AIR
S UF 0310
TO UF TRAINS

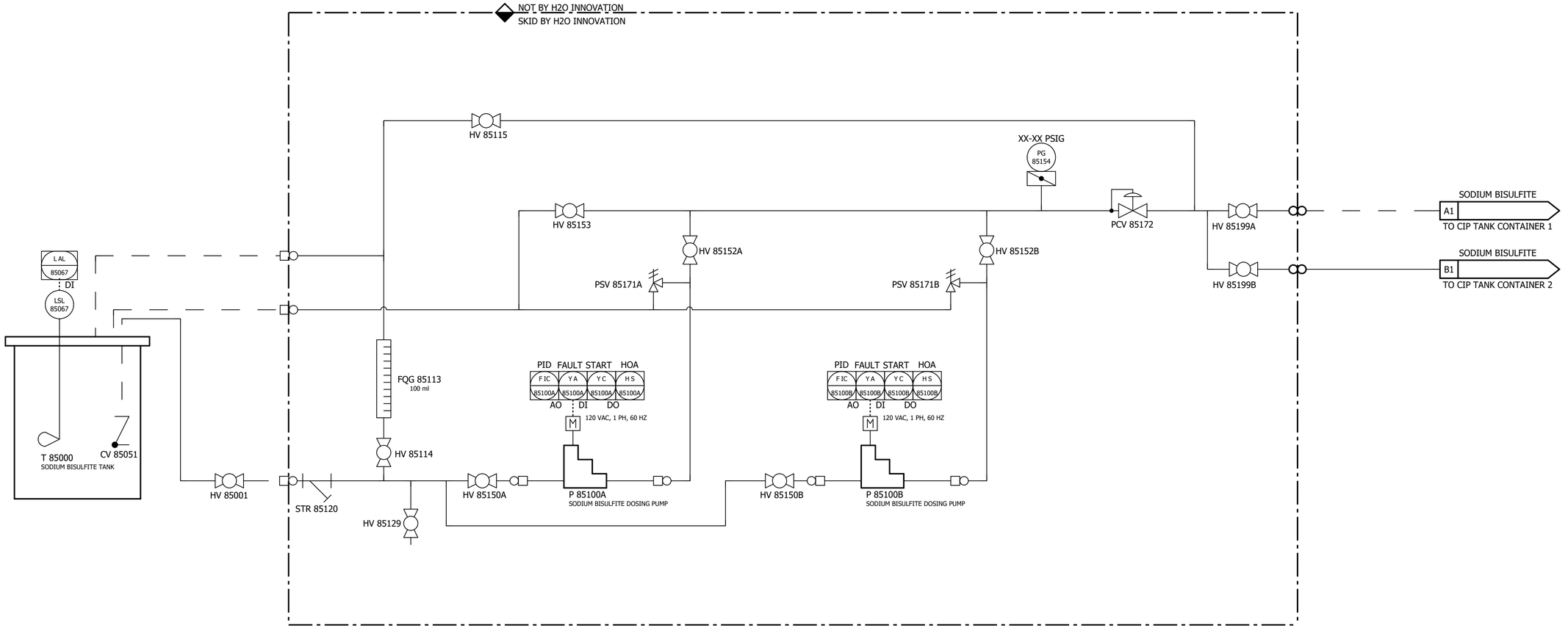
NOTES:
1. TIMED SOLENOID DRAIN TO BE CONNECTED TO CIP DRAIN PIPING.
2. AUXILIARY CONNECTION FOR BACK-UP COMPRESSOR
3. DRAWING IS TYPICAL FOR EACH CONTAINER

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| 00 | JAN 09, 2024 | ISSUED FOR CONSTRUCTION | BK | BK | MH |



# FLEXBOX_UF_06
## RENTAL EQUIPMENT
## 1700 GPM

TITLE :
## COMPRESSED AIR SYSTEM
## PIPING & INSTRUMENTATION DIAGRAM
CFBUF06 - C01 - 0950




NOTES :

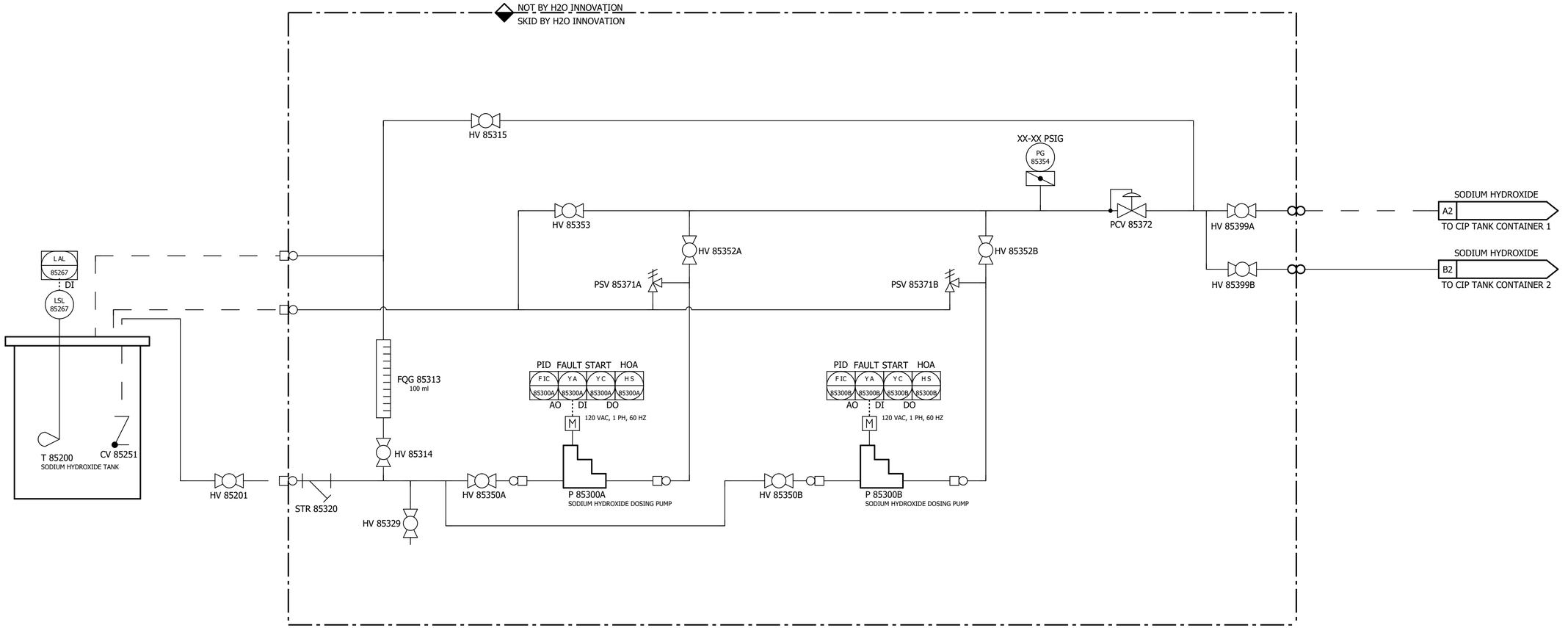
1. TUBING (10 FT) OUTSIDE THE SKID BOUNDARY WILL BE SUPPLIED BY H2O INNOVATION, SHIPPED LOOSE. TO BE INSTALLED ON SITE.
2. FOOT VALVES, CONNECTORS, AND TUBING FOR PUMP SUCTION WILL BE SUPPLIED BY H2O INNOVATION. TO BE INSTALLED ON SITE.
3. TO BE LOCATED OUTDOORS, PROTECTED BY OWNER SUPPLIED STRUCTURE

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| | | | | | |



# FLEXBOX UF
## CITY OF SANDY, OR
2.0 MGD

TITLE :
SODIUM BISULFITE
PIPING & INSTRUMENTATION DIAGRAM
U5588 - C01 - 0850.1




NOTES :

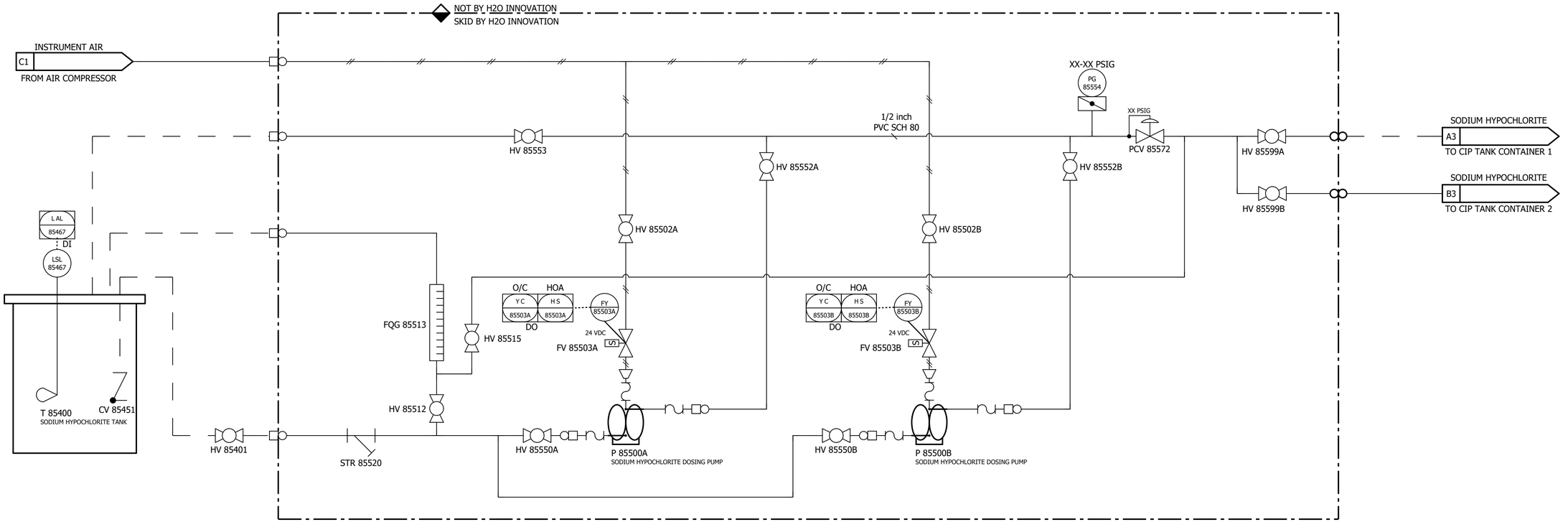
1. TUBING (10 FT) OUTSIDE THE SKID BOUNDARY WILL BE SUPPLIED BY H2O INNOVATION, SHIPPED LOOSE. TO BE INSTALLED ON SITE.
2. FOOT VALVES, CONNECTORS, AND TUBING FOR PUMP SUCTION WILL BE SUPPLIED BY H2O INNOVATION. TO BE INSTALLED ON SITE.
3. TO BE LOCATED OUTDOORS, PROTECTED BY OWNER SUPPLIED STRUCTURE

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| | | | | | |



# FLEXBOX UF
## CITY OF SANDY, OR
2.0 MGD

TITLE :
SODIUM HYDROXIDE
PIPING & INSTRUMENTATION DIAGRAM
U5588 - C01 - 0850.2




NOTES :

1. TUBING (10 FT) OUTSIDE THE SKID BOUNDARY WILL BE SUPPLIED BY H2O INNOVATION, SHIPPED LOOSE. TO BE INSTALLED ON SITE.
2. FOOT VALVES, CONNECTORS, AND TUBING FOR PUMP SUCTION WILL BE SUPPLIED BY H2O INNOVATION. TO BE INSTALLED ON SITE.
3. TO BE LOCATED OUTDOORS, PROTECTED BY OWNER SUPPLIED STRUCTURE

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| | | | | | |

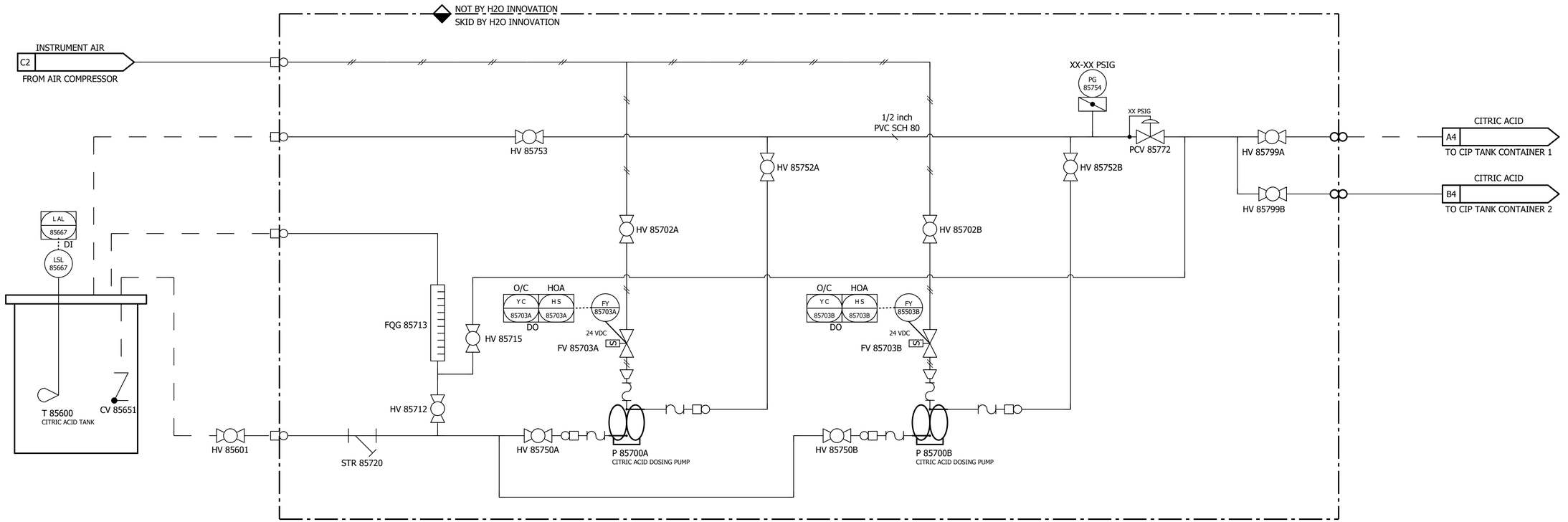


# FLEXBOX UF
## CITY OF SANDY, OR
## 2.0 MGD

TITLE :
## SODIUM HYPOCHLORITE
## PIPING & INSTRUMENTATION DIAGRAM
U5588 - C01 - 0850.3



REV : 782




NOTES :

1. TUBING (10 FT) OUTSIDE THE SKID BOUNDARY WILL BE SUPPLIED BY H2O INNOVATION, SHIPPED LOOSE. TO BE INSTALLED ON SITE.
2. FOOT VALVES, CONNECTORS, AND TUBING FOR PUMP SUCTION WILL BE SUPPLIED BY H2O INNOVATION. TO BE INSTALLED ON SITE.
3. TO BE LOCATED OUTDOORS, PROTECTED BY OWNER SUPPLIED STRUCTURE

| REV | DATE | DESCRIPTION | ENGINEER | CHECKED | APPROVED |
|---|---|---|---|---|---|
| | | | | | |



# FLEXBOX UF
## CITY OF SANDY, OR
2.0 MGD

TITLE :
CITRIC ACID
PIPING & INSTRUMENTATION DIAGRAM
U5588 - C01 - 0850.4

# APPENDIX M

# Container Arrangement Drawing

# (Envelope 1)

NOTES:

1. REFERENCE P&ID: CFBUF03-C01 (ALL SHEETS).
2. APPROXIMATE SHIPPING WEIGHT: 60,000 LBS.
3. CLEARANCE AND ACCESS REQUIRED AROUND ELECTRICAL PANELS, JUNCTION BOXES AND COMPONENTS IN ACCORDANCE WITH LOCAL ELECTRICAL CODES. NOT DEFINED BY H2O INNOVATION.
4. MATERIAL TEST REPORTS (MTR) TO BE PROVIDED FOR ALL MATERIAL.
5. ALL WELDS, EXCEPT FILLET WELDS, ARE TO BE GROUND FLUSH IN THE FLAT POSITION WITHOUT DISHING.
6. ALL WELDS ARE TO BE 100% VISUALLY INSPECTED.
7. STITCH WELDS ARE NOT ALLOWED UNLESS PRE-APPROVED BY H2O INNOVATION.
8. STRUCTURAL STEEL WELDING AS PER STRUCTURAL WELDING CODE - STEEL, AWS D1.1.
9. NO VERTICAL DOWN WELDS ARE ALLOWED UNLESS CERTIFIED PER AWS D1.1 AND APPROVED BY H2O INNOVATION.
10. STRUCTURAL CHANNEL, ANGLES, AND PLATE PER ASTM A36. THE MINIMUM YIELD STRENGTH REQUIRED FOR ALL MATERIAL IS 36 KSI, UNO.
11. HOLLOW STRUCTURAL STEEL SECTIONS PER ASTM A500, GRADE B; 46 KSI YIELD STRENGTH MINIMUM.
12. PUT 1/8 IN RADIUS ON ALL CORNERS, FOR SAFETY.
13. BREAK ALL SHARP EDGES, AND REMOVE SPATTER.
14. SINGLE MEMBERS TO BE CONTINUOUS. SEAMED MEMBERS ARE NOT ACCEPTABLE.
15. SAND BLAST FRAME TO SSPC-SP10 FINISH, ACCEPTABLE FOR POWDER COATING OR PAINTING.
16. FRAME TO BE EPOXY COATED. POLYAMIDE EPOXY PRIMER: PITT-GUARD 95-245 SERIES WITH MINIMUM DRY FILM THICKNESS PER COAT OF 4 TO 7 MILS; ACRYLIC ALIPHATIC URETHANE TOP COAT: PITTHANE ULTRA 95-812 SERIES, RAL5010 (BLUE) WITH MINIMUM DRY FILM THICKNESS OF 2 TO 3 MILS PER COAT TO ACHIEVE FINAL 8 TO 13 MILS TOTAL DRY FILM THICKNESS.
17. BUTTERFLY VALVES BETWEEN FLANGES MUST BE INSTALLED WITH THE DISC FULLY OPEN TO AVOID DAMAGING THE SEAT AND TO ENSURE PROPER VALVE OPERATION.
18. ALL STAINLESS STEEL PIPING TO BE ELECTRO-FUSION WELDED (EFW) ASTM A312. ALL STAINLESS STEEL FITTINGS TO BE ASTM A403. FLANGES TO BE ASTM A182 AND ANSI B 16.5.
19. CLASS 150 FITTINGS SHALL MEET MSS SP114 STANDARDS FOR SIZES 1/8 IN THRU 4 IN. THREADS SHALL MEET ANSI B1.20.1. MATERIAL IS ASTM A351 GRADE CF8M OR ASTM A182 OR ASTM A276 GRADE 316.
20. WELDER CERTIFICATIONS FOR ALL WELDERS MUST BE PROVIDED TO H2O INNOVATION.
21. COMPLETED SPOOL MUST BE HYDROSTATICALLY TESTED TO 90 PSIG.
22. COMPLETED ASSEMBLY MUST BE LEAK TESTED TO 50 PSIG.
23. UNWITNESSED TEST REPORT MUST BE PROVIDED.
24. USE SS WIRE BRUSH TO REMOVE HAZ (HEAT AFFECTED ZONE) AFTER WELDING.
25. ALL STAINLESS STEEL PIPING TO BE CLEANED, PICKLED (DIPPED IN A NITRIC-HYDROFLUORIC ACID SOLUTION) AND PASSIVATED TO ASTM A380, FOR A UNIFORM WHITE PICKLED FINISH.
26. INTERCONNECTING PIPING MUST BE FULLY SUPPORTED AND MUST NOT TRANSFER LOAD TO THE SKIDDED PIPING.
27. STAINLESS STEEL TANKS BE FABRICATED IN 316 AND TO HAVE INTERIOR, EXTERIOR, AND WELDS PICKLED WITH A PICKLING COMPOUND. PROCEDURE AND PRODUCT INFO TO BE SUBMITTED TO H2O INNOVATION FOR APPROVAL. FINAL FINISH TO BE GLASS BEAD BLAST. CIP TANK TO BE LINED INTERNALLY WITH NYLON. CIP TANK TO BE LINED INTERNALLY WITH NYLON.
28. ALL GROOVES FOR GROOVED COUPLING INSTALLATION ON SS PIPING TO BE ROLLED GROOVES UNLESS IT IS TECHNICALLY NOT FEASIBLE TO DO SO.
29. BOLTS AND NUTS ARE STAINLESS STEEL TYPE 316.
30. BOLTS AND NUTS TO HAVE MECHANICAL PROPERTIES PER CONDITION CW OF ASTM F593/F594.
31. BOLTS AND NUTS TO HAVE THREADS PER ANSI/ASME B1.1 CLASS 2A.
32. WASHERS AND & LOCK WASHERS ARE STAINLESS STEEL TYPE 316 WITH DIMENSIONS PER ASME B18.21.1.
33. ALL PVC PIPE TO BE SCHEDULE 80, GRAY. PIPE MATERIAL TO CONFORM TO ASTM D1784. PHYSICAL DIMENSIONS, SCHEDULES, AND TOLERANCES TO CONFORM TO ASTM D1785.
34. ALL PVC FITTINGS TO BE SCHEDULE 80, GRAY. SOCKET FITTINGS TO CONFORM TO ASTM D2467.
35. PVC FLANGES 3 IN AND LARGER TO BE VAN STONE STYLE WITH GLASS FILLED PVC RING. PVC FLANGES 2 IN AND SMALLER TO BE VAN STONE STYLE WITH PVC RING, PVC FLANGES TO MEET CLASS 150 BOLT HOLE PATTERN PER ANSI B16.5.
36. PVC PRIMER TO CONFORM TO ASTM F656. PVC SOLVENT CEMENT TO CONFORM TO ASTM D2564.
37. EXPOSED PVC PIPING REQUIRES SUITABLE UV PROTECTIVE COATING ON SITE. NOT BY H2O INNOVATION.
38. ALL GASKETS TO CONFORM TO ASTM F477.
39. ALL ELASTOMERS TO BE CHLORAMINE RESISTANT.
40. TAP (1/2 IN NPT OR SMALLER ONLY) INTO PVC / CPVC FITTING IS ALLOWED, BUT ONLY IN SPECIFIC LOCATIONS WHERE NO ADEQUATE FITTING IS PROVIDED.
41. ALL GROOVES FOR GROOVED COUPLING INSTALLATION ON PVC/CPVC PIPING TO BE ROLLED GROOVES UNLESS IT IS TECHNICALLY NOT FEASIBLE TO DO SO.
42. TUBING MATERIAL IS POLYETHYLENE.
43. FOR SODIUM HYPOCHLORITE SERVICE, DRILL A VENT HOLE IN EACH BALL VALVE BY FOLLOWING H2O PROCEDURE 'H45 - PLASTIC BALL VALVE DRILLING PROCEDURE FOR SODIUM HYPOCHLORITE'.
44. GLUE FOR CONCENTRATED SODIUM HYPOCHLORITE SKIDS TO BE WELD-ON CPVC 724 OR OTHER SILICA-FREE PRODUCT. CAN BE USED FOR PVC OR CPVC PIPE.
45. NO HIGH POINTS PERMITTED IN SODIUM HYPOCHLORITE DOSING PUMP SUCTION LINES. CAN RESULT IN LOSS OF PRIME.
46. ELECTRICAL CONDUIT MATERIAL IS RIGID PVC.



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DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/64"
HOLE CENTERS: ±1/64"
DO NOT SCALE PRINTS

CONTAINERIZED UF SYSTEM
RENTAL EQUIPMENT

1700 GPM

TITLE:
CONTAINER LAYOUT
GENERAL ARRAGNEMENT

SCALE: N/A

DRAWING NUMBER: CFBUF03-B01-0001
SHEET: 1 OF 5

REVISION: 00


ISO VIEW

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CONTAINERIZED UF SYSTEM
RENTAL EQUIPMENT

1700 GPM

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CONTAINER LAYOUT
GENERAL ARRAGNEMENT

SCALE: N/A

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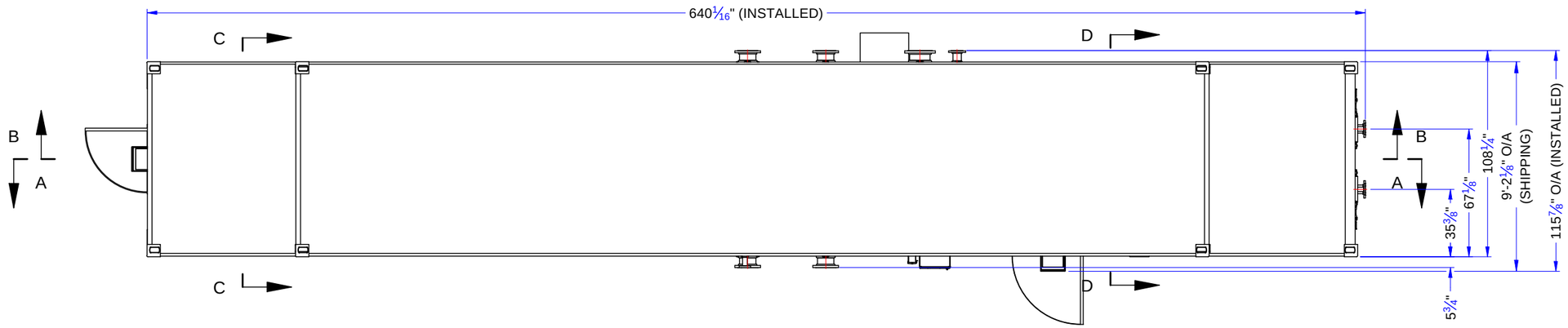
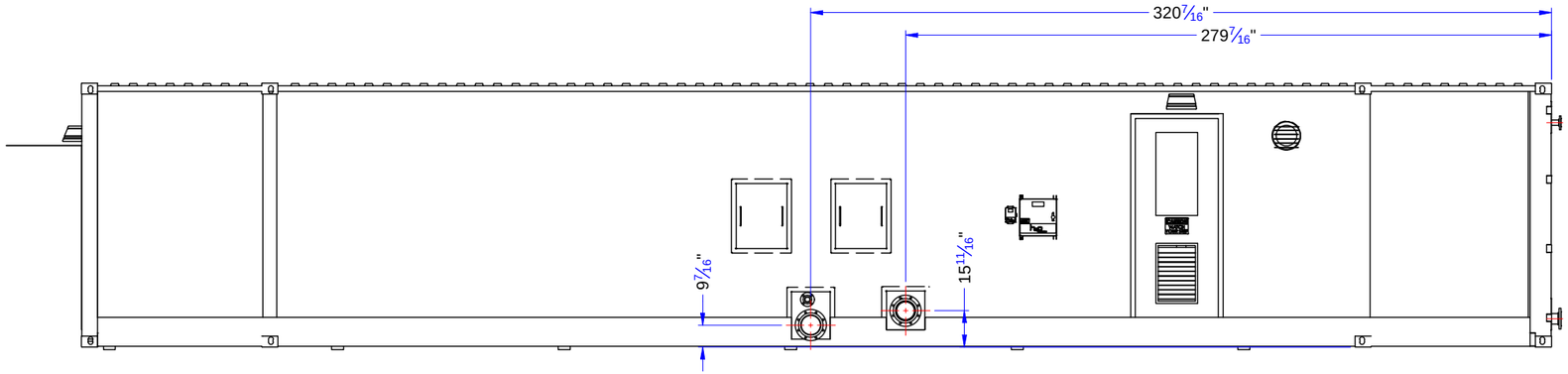
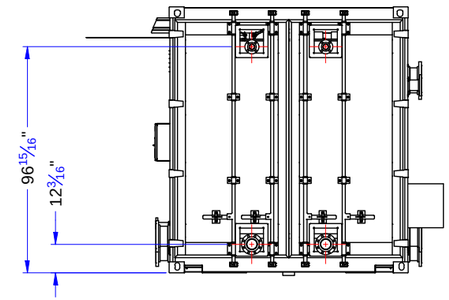


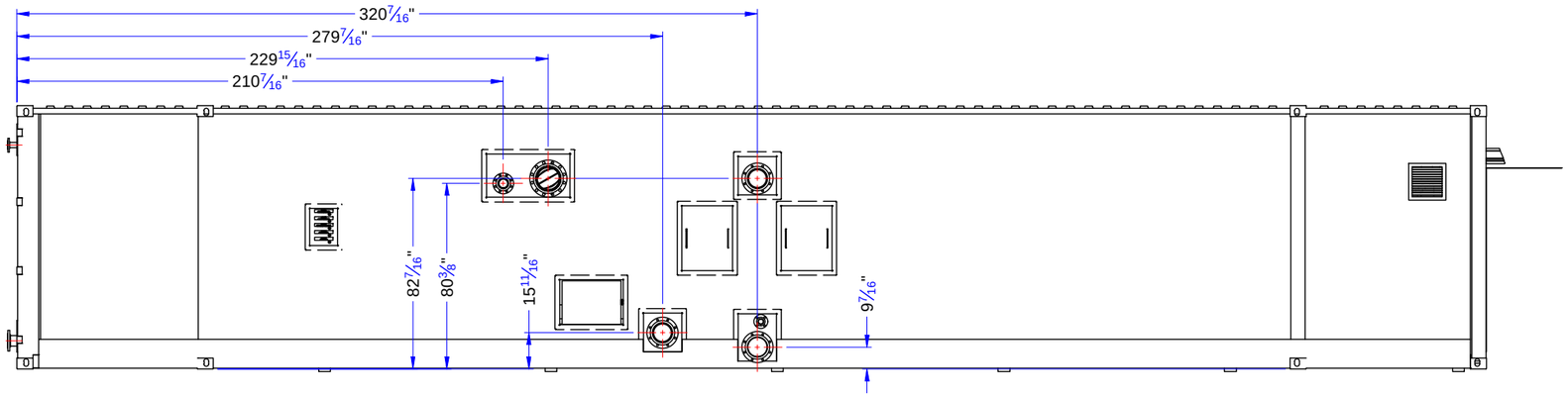

TOP VIEW




FRONT VIEW




RIGHT SIDE VIEW




BACK VIEW

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CONTAINERIZED UF SYSTEM
RENTAL EQUIPMENT

1700 GPM

TITLE:
CONTAINER LAYOUT
GENERAL ARRAGNEMENT

SCALE: N.T.S.

DRAWING NUMBER: CFBUF03-B01-0001
SHEET: 3 OF 5

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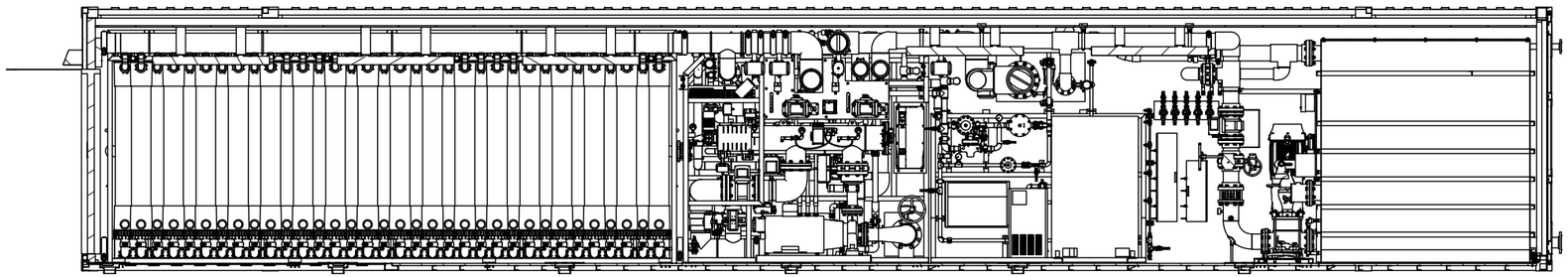
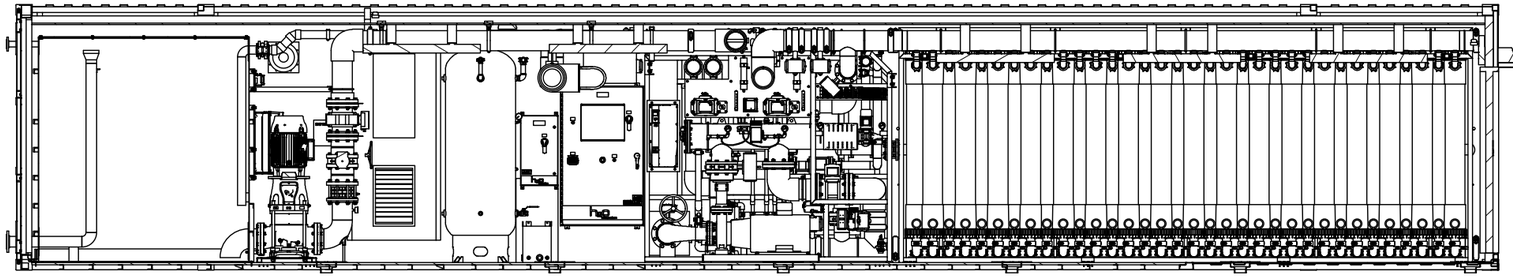
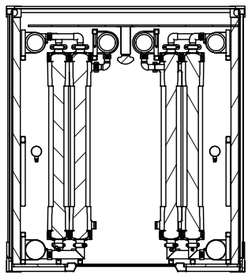


SECTION A-A



SECTION B-B



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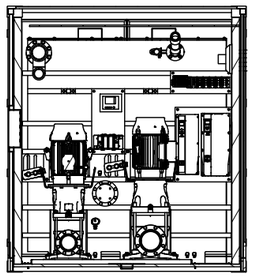

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CONTAINERIZED UF SYSTEM
RENTAL EQUIPMENT

1700 GPM

TITLE:
CONTAINER LAYOUT
GENERAL ARRAGNEMENT

SCALE: N.T.S.

DRAWING NUMBER: CFBUF03-B01-0001
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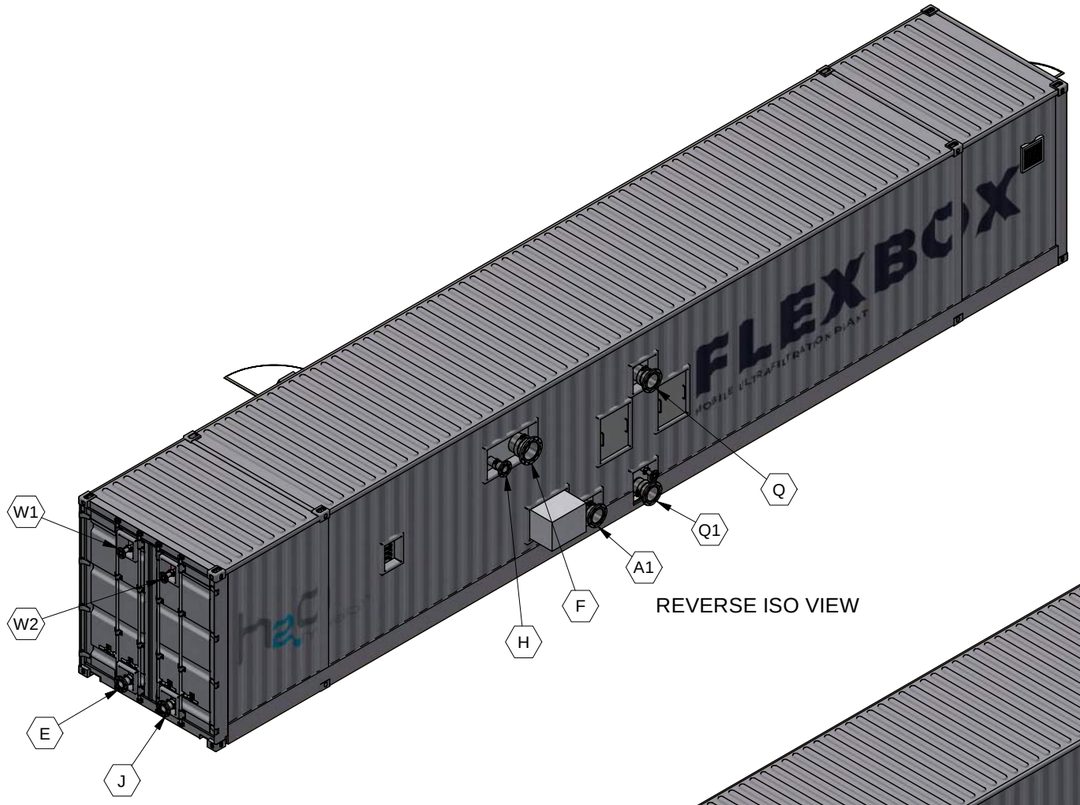
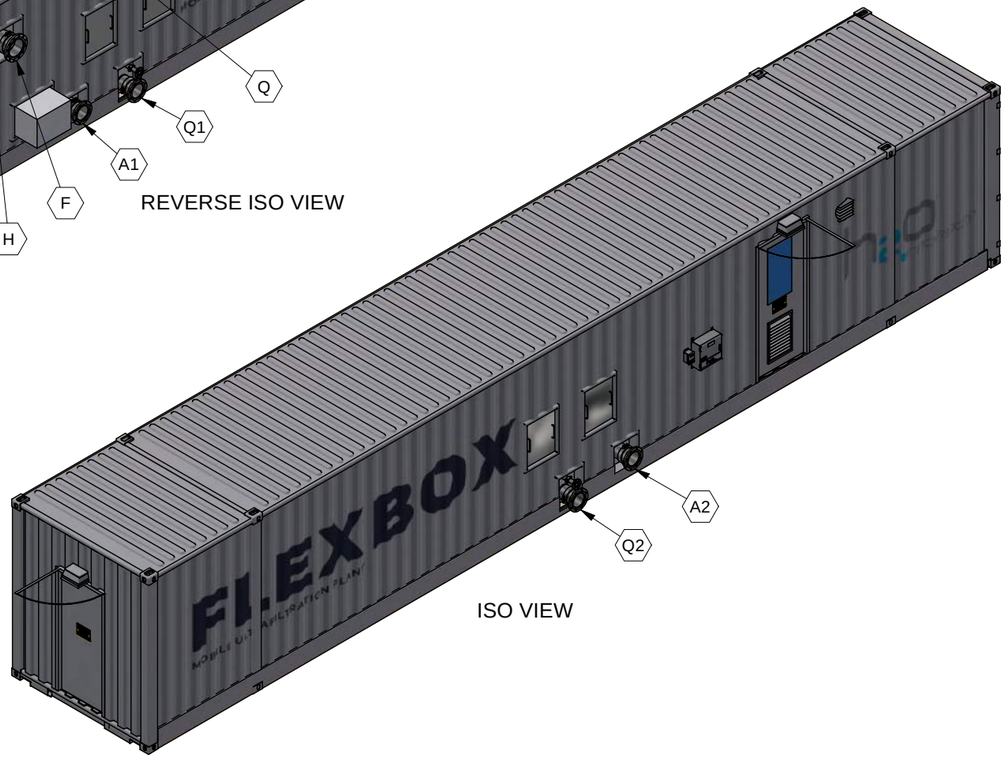
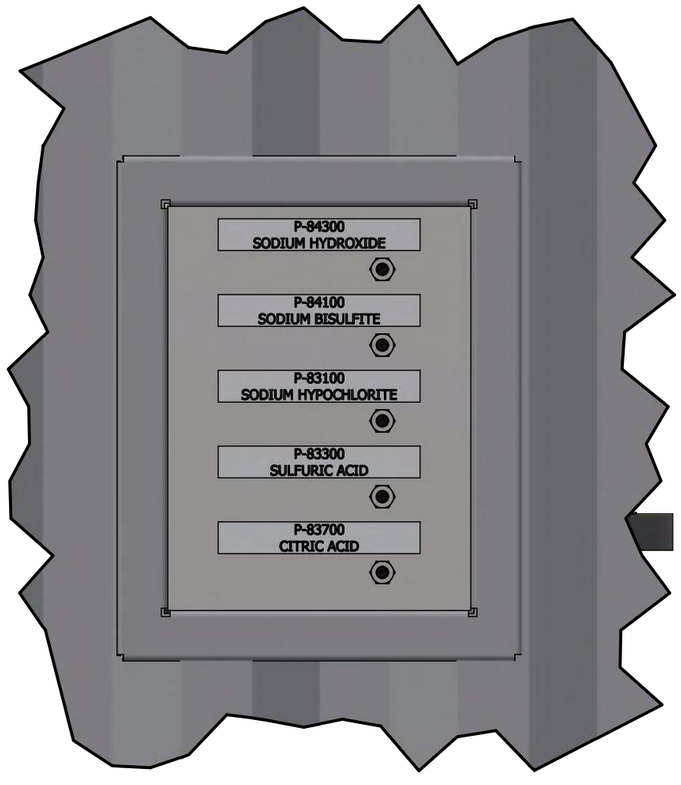
| NOZZLE# | DESCRIPTION | MATERIAL | DIAMETER | CONNECTION |
|---|---|---|---|---|
| A1 | UF FEED WATER, TRAIN #1 | PVC, SCH.80 | 8" | GROOVED/ FLANGED |
| A1 | UF FEED WATER, TRAIN #2 | PVC, SCH.80 | 8" | GROOVED/ FLANGED |
| Q | COMBINED BACKWASH WASTE | PVC, SCH.80 | 8" | GROOVED/ FLANGED |
| Q1 | UF BACKWASH WASTE, TRAIN #1 | PVC, SCH.80 | 8" | GROOVED/ FLANGED |
| Q2 | UF BACKWASH WASTE, TRAIN #2 | PVC, SCH.80 | 8" | GROOVED/ FLANGED |
| F | COMBINED FILTRATE DISCHARGE | PVC, SCH.80 | 8" | GROOVED/ FLANGED |
| E | BACKPULSE TANK OVERFLOW / DRAIN | PVC, SCH.80 | 4" | GROOVED/ FLANGED |
| J | CIP TANK OVERFLOW / DRAIN | PVC, SCH.80 | 4" | GROOVED/ FLANGED |
| H | CIP WASTE | PVC, SCH.80 | 4" | GROOVED/ FLANGED |
| W1 | HOUSE WATER SUPPLY TO BP TANK | PVC, SCH.80 | 2" | GROOVED/ FLANGED |
| W2 | HOUSE WATER SUPPLY TO CIP TANK | PVC, SCH.80 | 2" | GROOVED/ FLANGED |




REVERSE ISO VIEW




ISO VIEW




CONNECTIONS FOR CHEMICAL
(½" TUBE CONNECTIONS)



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RENTAL EQUIPMENT

1700 GPM

TITLE:
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GENERAL ARRAGNEMENT

SCALE: N/A

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SHEET: 5 OF 5

REVISION: 00

# APPENDIX N

# Major Equipment Cutsheets

# (Envelope 1)


# SAF-X

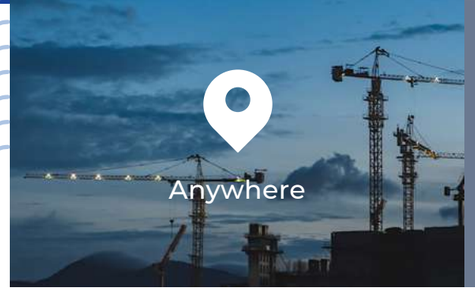
Highly efficient self-cleaning screen filter

amiad® WATER SYSTEMS

MASTERS OF FILTRATION

# MASTERS OF FILTRATION

Any Technology



Anywhere

Any Challenge

Any Water Source

## Your water challenge. Our filtration solution.

**Amiad Water Systems is a world leader in water treatment and filtration solutions.** For over 57 years Amiad has devoted its passion and commitment to developing a comprehensive line of water filtration systems for a wide range of industrial applications.

Our solutions are integrated into the core of water filtration systems in the following industries and applications: metal, plastic, energy, chemical, water treatment and salt water disposal.

We develop filters that are able to cope with any water quality, in any geographical location.

We've spent years mastering filtration technology so we can offer a wide range of filters for every industrial need, including screen, disc, microfiber or media technology.

Disc Technology

Screen Technology

Media Technology

Microfiber Technology

We consider every challenge as an opportunity to work side by side with our customers to solve their problems.

We'll go anywhere to ensure our filters perform as expected, 24/7, every day of the year.

When you want a high-performance solution for your water filtration system, consult with Amiad. We focus on doing what we do best.

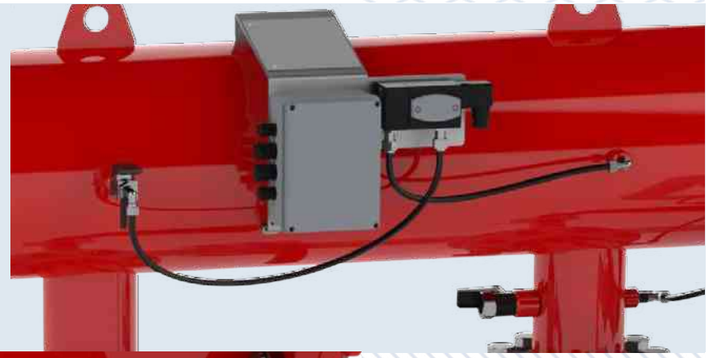
Amiad. Masters of Filtration.



# SAF-X
## FEATURES

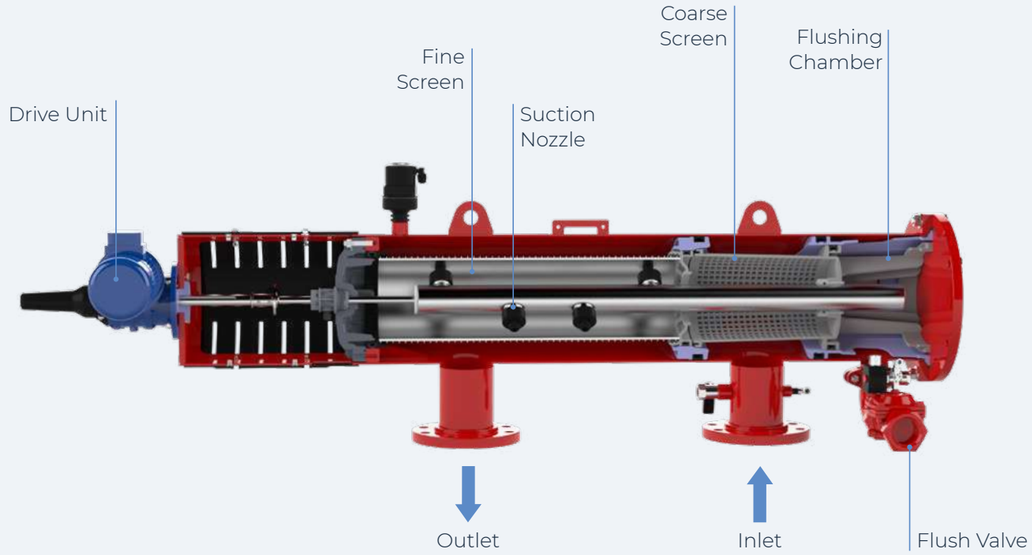
**Simple Maintenance**
Hinged lid for convenient opening and easy access

**Installation Flexibility**
Instrumentation can be installed on either side of the filter

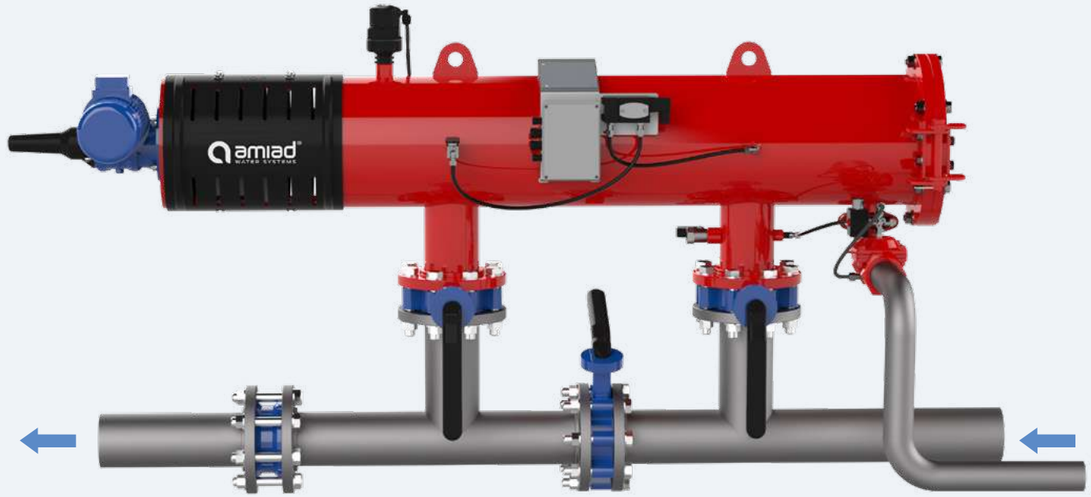


**Swivel Flushing Valve**
Enables positioning according to installation

## Cross Section

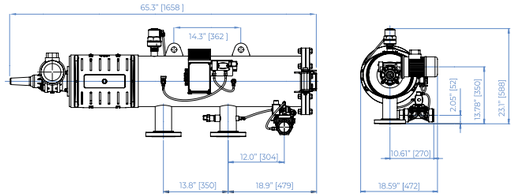



## Typical Installation

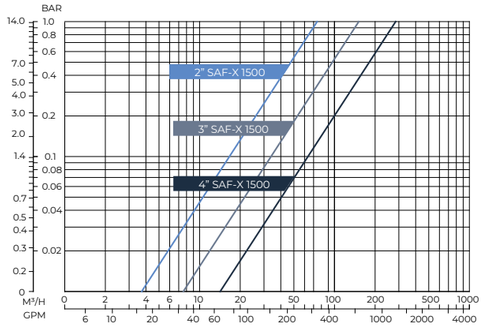


# SAF-X **Models**

## **SAF-X** 1500

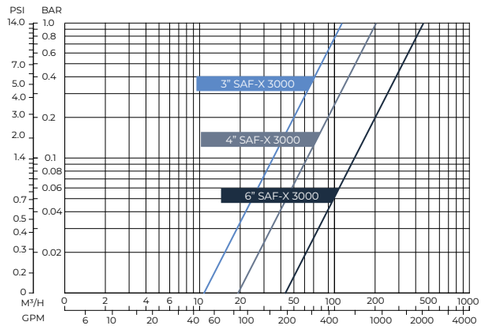



### Head Loss Graph (in clean water)

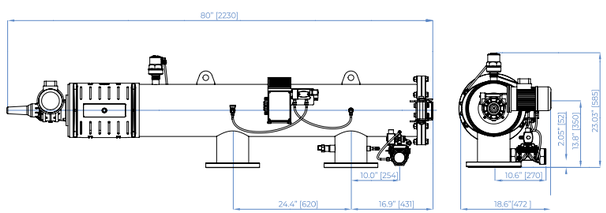


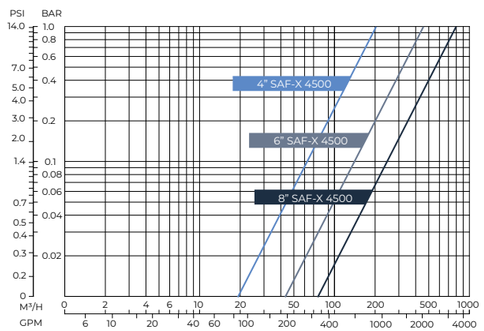

## **SAF-X** 3000




## **SAF-X** 4500




inch (mm)

*Approx. length required for maintenance

## Technical Specifications

| Filter Model | SAF-X 1500 | SAF-X 3000 | SAF-X 4500 |
|---|---|---|---|
| **General data** | | | |
| Max. flow rate* (130µ) | 352 gpm (80 m³/h) | 700 gpm (160 m³/h) | 1,060 gpm (240 m³/h) |
| Design pressure | 150 psi (10 bar) | | |
| Min. operating pressure | 30 psi (2 bar) | | |
| Working temperature | 39.2°-122°F (4°-50°C) | | |
| Filtration area | 233 in² (1,500 cm²) | 465 in² (3,000 cm²) | 700 in² (4,500 cm²) |
| Inlet / Outlet diameter | 2" (50 mm), 3" (80 mm), 4" (100 mm) | 3" (80 mm), 4" (100 mm), 6" (150 mm) | 4" (100 mm), 6" (150 mm), 8" (200 mm) |
| Filter housing | 10" (250 mm) | | |
| Weight: empty/operational (per inlet/outlet diameter) | 2" (50 mm) 238/348 lb (108/158 kg)<br>3" (80mm) 340/354 lb (109.161 kg)<br>4" (100 mm) 242/361 lb (110/164 kg) | 3" (80 mm) 288/436 lb (131/198kg)<br>4" (100 mm) 290/440 lb (132/200 kg)<br>6" (150 mm) 293/451 lb (133/205 kg) | 4" (100 mm) 339/521 lb (154/237 kg)<br>6" (150 mm) 341/530 lb (155/241 kg)<br>8" (200 mm) 343/543 lb (156/247 kg) |

* Consult manufacturer for optimum flow depending on filtration degree & water quality.

| **Electronic control** | |
|---|---|
| Control voltage | 24V AC or DC |
| Electric motor | 1/4 HP (0.18 Kw) 50/60 Hz |
| Rated operation voltage | Three-phase, 230/400/460V, 50/60 Hz<br>Single-phase, 110/220V, 50/60 Hz |
| Current consumption | 0.6 Amp. (with three-phase 400V) |

| **Flushing data**** | | | |
|---|---|---|---|
| Exhaust valve | 2" (50 mm) | | |
| Flushing time | 20 sec. | | |
| Reject water volume per flush cycle | 10 gallon (39 liter) | 20 gallon (78 liter) | 30 gallon (117 liter) |
| Flushing flow rate | 31 gpm (7 m³/h) | 62 gpm (14 m³/h) | 93 gpm (21 m³/h) |

** Standard nozzle at 35 psi (2.5 bar)

| **Construction materials** | |
|---|---|
| Filter housing and lid | Epoxy-coated carbon steel 37-2 (Stainless steel 316 available on request) |
| Screens | Stainless steel 316 |
| Cleaning mechanism | Stainless steel 316, POM, PVC |
| Exhaust valve | Epoxy-coated cast iron, natural rubber |
| Seals | Synthetic rubber |
| Control | Aluminium, brass, stainless steel, PVC |

**Standard Filtration Degrees**

| | Stainless Steel Weave-wire Screen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| micron | 800 | 500 | 300 | 200 | 130 | 100 | 80 | 50 | 40 | 30 | 20 | 10 |
| mm | 0.8 | 0.5 | 0.3 | 0.2 | 0.13 | 0.1 | 0.08 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 |

## Headquarters

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910101-001203/12.2021

ARO®

# ¼" Dosing and Transfer Pump

*Same Great Name. Revolutionary New Design.*


Ingersoll Rand®

ARO®

# The Industry's Best Dosing Pump Just Got A ¼" Better.

When we set out to redesign our ¼" double diaphragm pump, we insisted on the industry's best priming, performance and precision. We wanted a pump that would stand apart with clog-free operation and best-in-class suction and flow, yet still be compatible with other systems. We even added out-of-the-box custom options like solenoid control, a sophisticated leak detection system and end-of-stroke sensors. What we created was the ARO ¼" Dosing & Transfer Pump that's not only worth the wait, but worthy of your business.


www.ingersollrandproducts.com/ARO

800-483-4981

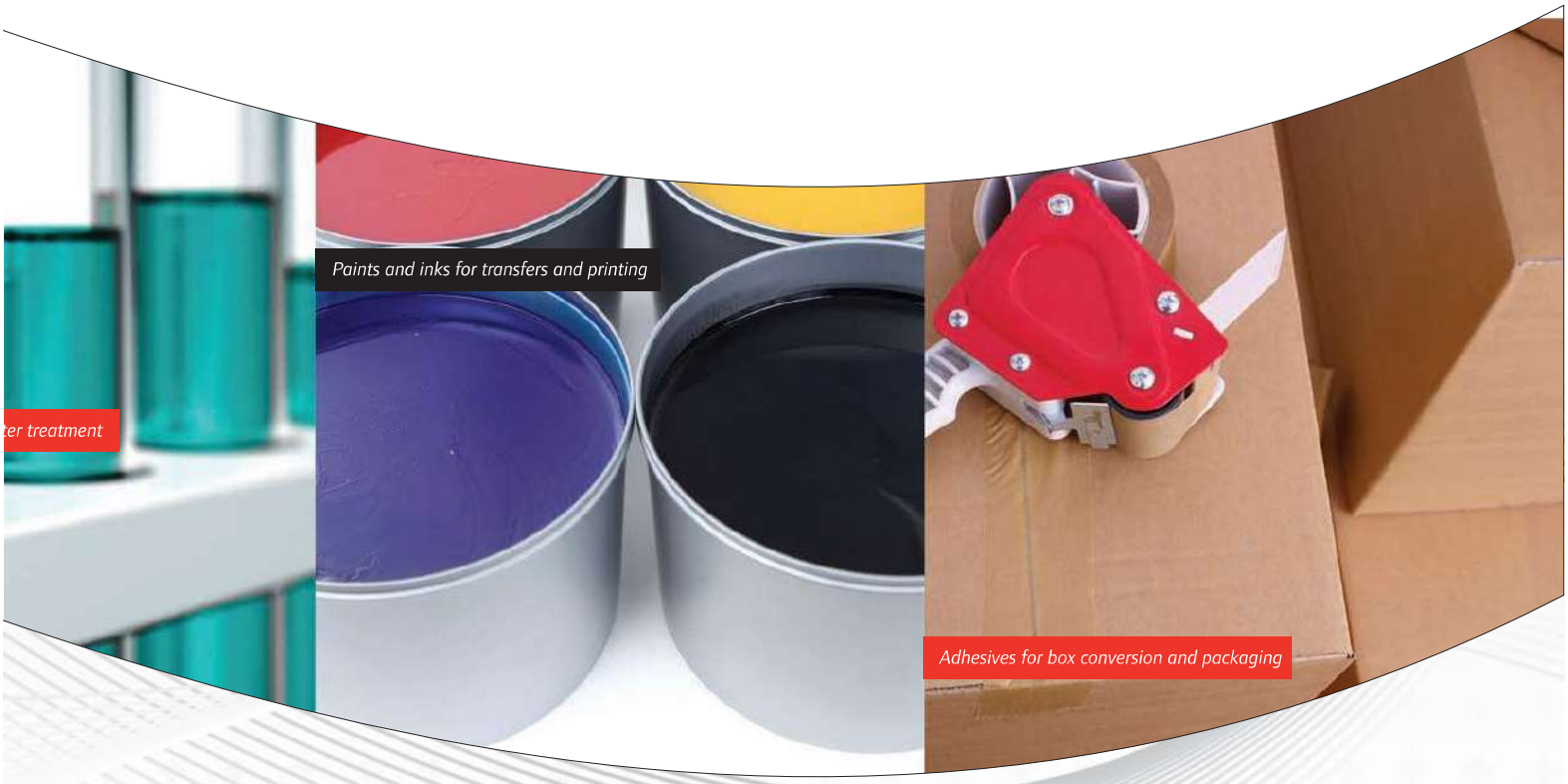
## Compact in design, yet large on features.

Only ARO could pack so many features into a compact, ¼" pump.

- Versatile OEM fluid dosing, from cleaners to chemicals to paint
- Industry-leading controllability, suction and flow rate validation
- Standard mounting pattern for easy exchange with most competitive models
- Clog-free operation (1/16" max. dia. solids) to reduce down-time and system problems
- Maximum flow rate of up to 5.3 gallons per minute
- 125 psi capacity for viscous fluids, long pipe runs and injection applications
- Superior compatibility with competitor systems and equipment
- Easy installation and maintenance with no lubrication needed

## Plus options that offer built-in advantages.

- Integrated solenoid for volumetric repeatability (less than 3% variance)
- Flexible fluid checks that adjust to pass fibrous materials and semi-solids
- Built-in leak detection and end-of-stroke sensors



# *Industry-Leading Innovation For Industry-Leading Value.*

Trust Ingersoll Rand to design an ARO pump that delivers benefits to virtually any system.

**ACCURACY**
Pinpoint accuracy and consistency for precise dosing of a wide variety of fluids.

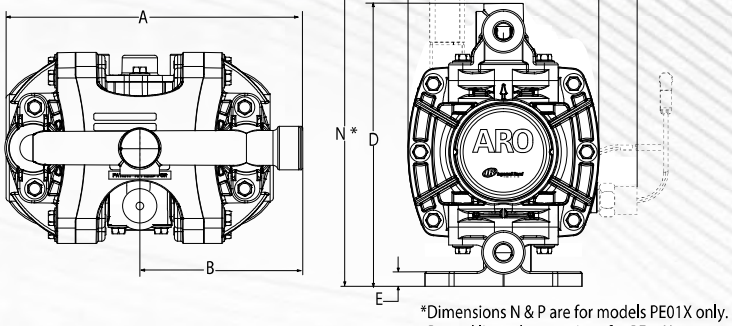
**PERFORMANCE**
Clog-free operation, high-pressure capability, and unmatched suction lift and flow.

**SAFETY**
Bolted construction, ported exhaust to reduce noise and potential contamination, optional leak detection kit, and ATEX-compliant models for worldwide safety.

**FLEXIBILITY**
Capability to handle a broad range of viscosities, plus industry-leading compatibility including an optional mounting plate that adapts to competitor footprints with minimal modifications.

**VALUE**
Custom options to design your pump to fit your needs, plus our exclusive five-year warranty for peace of mind.

| Dimensions | | | |
|---|---|---|---|
| **A** | 7.2″ (182mm) | **K** | 3.9″ (99mm) |
| **B** | 3.9″ (100mm) | **L** | 2.1″ (53mm) |
| **C** | 4.6″ (117mm) | **M** | 3.2″ (81mm) |
| **D** | 6.8″ (173mm) | **Q** | 1/4-18 PTF SAE Short |
| **E** | 0.3″ (8.8mm) | **R** | 3/4-14 NPTF |
| **F** | 6.1″ (156mm) | **S** | 1/4 NPTF / BSPT Hybrid |
| **G** | 0.8″ (20.7mm) | **T** | 1/4 NPTF / BSPT Hybrid |
| **H** | 1.9″ (48.6mm) | **U** | 3/4-14 NPTF |
| **J** | 2.4″ (61mm) | | |




*Dimensions N & P are for models PE01X only.
Dotted lines show options for PE01X pumps.

| **22mm Connectors** (optional must be ordered separately) | |
|---|---|
| **CHW** | Straight connector with cable 36″ (914mm) located on top |
| **CSN** | Strain relief, without indicator light or cable |

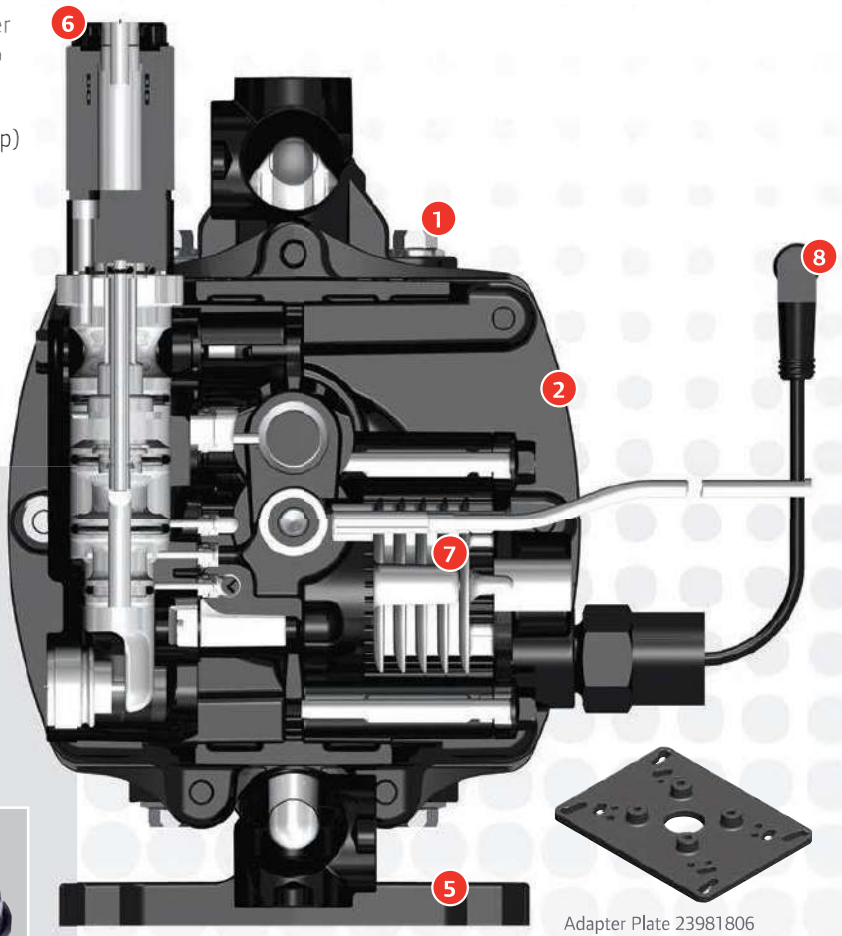
*CHW* *CSN*

Additional Connectors are available. Consult your ARO representative for more options.

# Engineered To Tame The Toughest Fluids.

Our newly designed ARO ¼" Dosing & Transfer Pump is built to last with high-performance to maximize productivity.

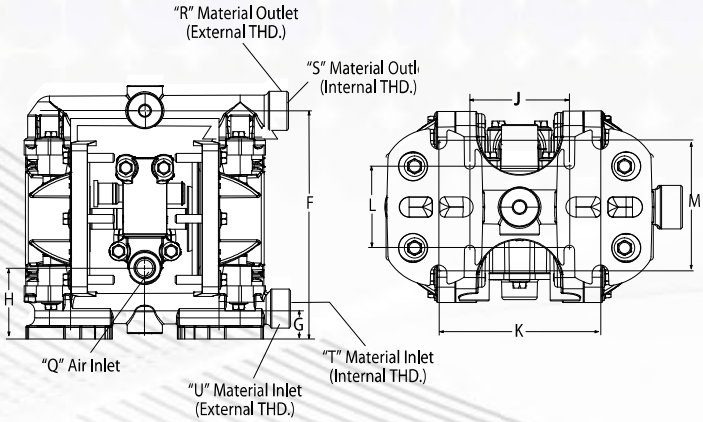
1. Stainless steel bolts (more than any other pump) for leak-free operation
2. Corrosion-resistant materials for added durability, reliability and safety
3. Internal and external manifold threads for easy installation and improved suction "not shown"
4. Longer-lasting diaphragm available in your choice of materials "not shown"
5. Mounting brackets that interchange with most major competitor pumps
6. Solenoid-actuated valve* for greater control (plus PE version with time-based solenoid control)
7. End-of-stroke monitoring* (integrated in muffler) to provide valuable data
8. Infrared leak detection sensors* that immediately detect a breach of fluid
9. Our Patented Flex-Checks™ *
   - Pass stringy and fibrous fluids, as well as semi-solids up to 1/8"
   - Assure positive priming and 20% higher suction lift
   - Prevent siphoning, even after pump is turned off
   - Offer 360° mounting, ideal for applications where space is tight
   - Are designed to be self-cleaning
   - Demonstrate excellent resistance to abrasive, highly loaded fluids






Adapter Plate 23981806 available for "quick retrofit" to Graco, Wilden, Warren- Rupp and more.

*** Optional features to customize your pump.**




| Specification | | |
|---|---|---|
| **Max Flow** gpm(lpm) | | 5.3 (20) |
| **Noise Level** @ 70 psi, 60cpm | | 62.3 db(A) |
| **Max Solids** in(mm) | | 1/16 (1.6) |
| **Air Consumption @100psi** | | 6.1 scfm |
| **Max Air Inlet Pressure** psi(bar) | | 125 (8.6) |
| **Min Air Inlet Pressure** psi(bar) | | 10 (0.69) |
| **Max Outlet Pressure** psi(bar) | | 125 (8.6) |
| **Weight** lbs(kgs) | Polypropylene | 2.86 (1.30) |
| | PVDF | 3.88 (1.76) |
| | Acetal | 3.52 (1.60) |
| **Displacement / Cycle** @ 125 psi | | .019 gal (.072 ltr) |

# Tailor Your ¼" Pump To Your Application.

Whether you choose our standard ARO ¼" Dosing & Transfer Pump or add an electronic interface, our unique, modular design lets you customize your pump right off the shelf.

| Position | 1 | 2 | 3 | | 4 | 5 | 6 | | 7 | 8 | 9 | | 10 | 11* | 12* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PE | 01 | P | - | H | P | S | - | P | T | T | - | | D | |

* Apply to electronic interface models only.

| Position 1 | |
|---|---|
| **Code** | **Series** |
| PD | Standard |
| PE | Electronic Interface |

| Position 2 | |
|---|---|
| **Code** | **Port Size** |
| 01 | ¼" |

| Position 3 | |
|---|---|
| **Code** | **Center Section Material** |
| E | Groundable poly |
| F | Poly w/ leak detection* |
| P | Polypropylene |

| Position 4 | |
|---|---|
| **Code** | **Connection** |
| H | Hybrid ¼" NPT/BSP |

| Position 5 | |
|---|---|
| **Code** | **Wetted Parts** |
| D | Groundable acetal |
| K | PVDF (Kynar®) |
| P | Polypropylene |

| Position 6 | |
|---|---|
| **Code** | **Hardware** |
| S | Stainless steel |

| Position 7 | |
|---|---|
| **Code** | **Seat Material** |
| D | Acetal |
| K | PVDF |
| P | Polypropylene |
| 0 | Poly (flex check spacer) |
| 1 | Acetal (flex check spacer) |
| 2 | PVDF (flex check spacer) |

| Position 8 | |
|---|---|
| **Code** | **Ball Material** |
| A | Santoprene |
| C | Hytrel |
| G | Nitrile |
| J | Nitrile (flex check only) |
| K | EPR (flex check only) |
| L | Viton (flex check only) |
| N | Neoprene (flex check only) |
| T | PTFE |

| Position 9 | |
|---|---|
| **Code** | **Diaphragm Material** |
| A | Santoprene |
| C | Hytrel |
| G | Nitrile |
| T | PTFE |

| Position 10 | |
|---|---|
| **Code** | **Revision** |
| A | First |

| Position 11* | |
|---|---|
| **Code** | **Specialty Code 1** |
| A | Solenoid 120VAC, 110VAC and 60VDC |
| B | Solenoid 12VDC, 24VAC and 22VAC |
| C | Solenoid 240VAC, 220VAC and 120VDC |
| D | Solenoid 24VDC, 48VAC and 44FAC |
| G | Solenoid 12VDC ATEX Zone 1 |
| H | Solenoid 24VDC ATEX Zone 1 |
| K | Solenoid 220VAC ATEX Zone 1 |
| N | Solenoid (no coil) |
| O | Standard valve block (no solenoid) |

| Position 12* | |
|---|---|
| **Code** | **Specialty Code 2** |
| E | End-of-stroke feedback + leak detection w/ connector |
| F | End-of-stroke feedback w/ connector |
| L | Leak detection only |
| N | End-of-stroke feedback + leak detection (no connector) |
| P | End-of-stroke feedback (no connector) |
| O | No option |

# Vertical Multistage High Pressure Pumps

# GRUNDFOS CRN

The Grundfos CRN high pressure series provides all the benefits of the renowned Grundfos CR in a solution tailored to handle a variety of liquids from potable water to industrial liquids within a very wide temperature, flow and pressure scale.

## Key Features and Benefits

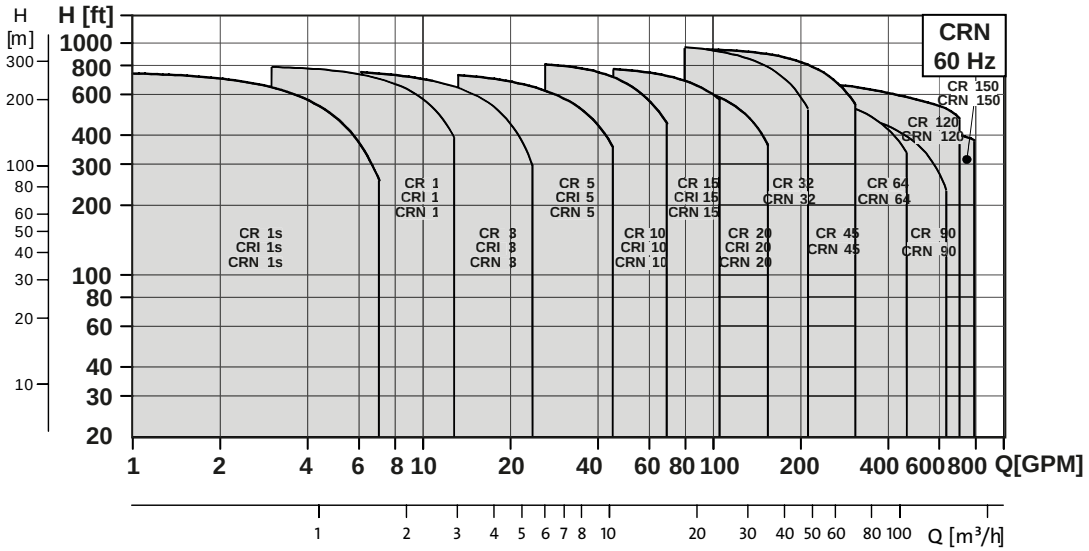
- Compact, inline design fits into small footprint
- Easy installation and operation with settings and internal connections done at factory
- Highly efficient design reduces energy consumption by up to half compared to fixed speed pumps
- Unique cartridge seal design can be replaced in minutes
- Spacer coupling allows motor to be left in place during seal replacement
- Remote control/fieldbus monitoring and data collection
- Building management system compatible
- User friendly controller interface with advanced features and functionality
- Laser welded stainless impellers promote class leading efficiency
- Optional CR Cool-Top™ allows pump to withstand liquid temperatures of up to 356°F
- Integrated sensor available
- Eleven flow sizes, with a variety of shaft seals, rubber materials and supply voltages
- MAGdrive option available for demanding industrial applications where zero-leakage is required operating range
- AISI 316 stainless steel throughout

**APPLICATIONS**

- Industrial process water
- Washing and cleaning
- High pressure washdown
- Boiler feed and condensate
- Ultra-filtration
- Reverse osmosis

# CRN Technical Data

| CRN Information | |
|---|---|
| Flow, Q: | max. 790 gpm (179.4 m³/h) |
| Head, H: | max. 985 ft. (300 m.) |
| Liquid temp: | -22°F to +248°F (-30°C to 120°C) |
| Working press: | max. 435 psi (30 bar) |



# NBS, NBSE

**Fixed speed range**

**Speed-controlled, non-sensor range**

**Speed-controlled, Series 2000, 2-channel sensor range**

**Single-stage end-suction pumps with split coupled design**

**60 Hz - ANSI**

be
think
innovate

GRUNDFOS

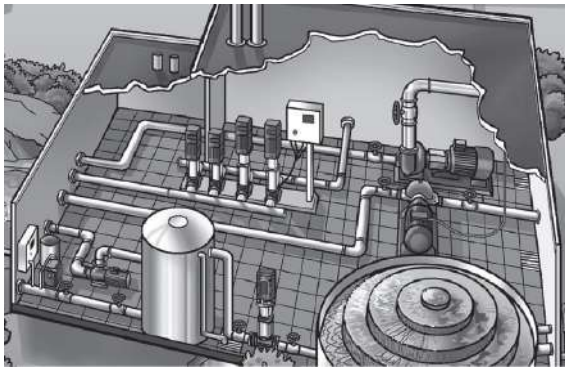
# 1. Applications

## Introduction

NBS are multipurpose pumps suitable for a variety of different applications demanding reliable and cost-efficient supply.

The pumps are used in five main fields of application:

- water supply
- industrial pressure boosting
- industrial liquid transfer
- HVAC
- irrigation.



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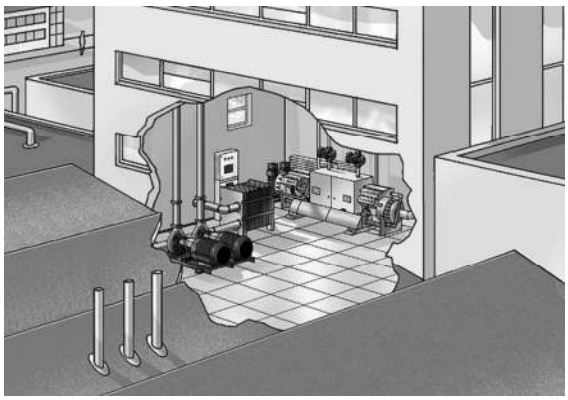
## Water supply

Besides general water supply in municipal and industrial waterworks, the pumps are used for these specific applications:

- filtration and transfer at waterworks
- pressure boosting in mains
- pressure boosting in high-rise buildings, hotels, etc.
- pressure boosting in industrial buildings
- various swimming bath applications
- drinking water (NSF61).



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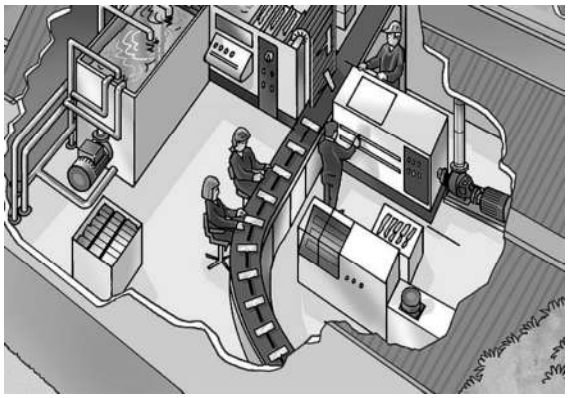
## Industrial pressure boosting

Pressure boosting in these applications:

- industrial washing and cleaning systems
- industrial wash-down systems
- vehicle washing tunnels
- firefighting systems.



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## Industrial liquid transfer

Liquid transfer in these applications:

- cooling and air-conditioning systems, refrigerants
- boiler-feed and condensate systems
- aquafarming
- industrial heating systems
- district heating plants.

## HVAC

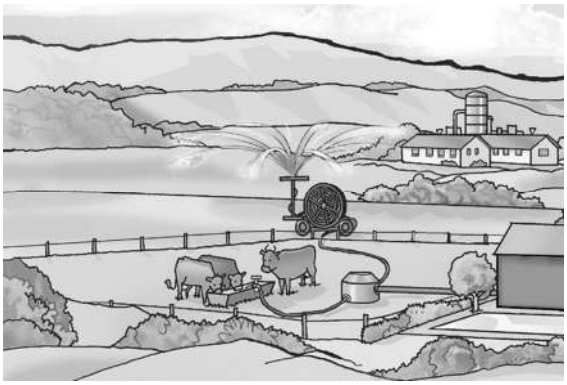
Liquid transfer in these applications:

- heating systems
- ventilation systems
- air-conditioning systems.

## Irrigation

Irrigation covers these applications:

- field irrigation, flooding
- sprinkler irrigation
- drip-feed irrigation.



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# 2. Features and benefits

## Features

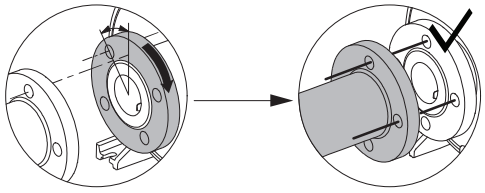
The pumps offer the following features:

- The pumps are non-self-priming, single-stage, centrifugal volute pumps with axial inlet port, radial outlet port and horizontal shaft.
- All pumps are according to ISO 5199 standards, adjusted for American dimensions on pump and its flanges.
- Inlet and outlet flanges are according to ASME 16.1/16.42.
- Dimensions and rated performance are according to 175/363 PSI (12/25 bar). The mechanical shaft seal has dimensions according to EN 12756.
- The pumps offer flow rates from 10 to 5800 GPM and heads from 8 to 450 ft.
- Motors with main dimensions to NEMA standards.
- The pumps can be equipped with an MLE motor with integrated frequency converter or connected to a Grundfos CUE external frequency converter.

## Benefits

The pumps offer the following benefits:

- Trimmed and balanced impellers allow customization, reduce noise and vibration for quiet operation and prolong seal and bearing life. Statically balanced according to ISO 1940-1 class 6.3.
- This space-saving design has 35 % smaller footprint than frame mount design.
- Reduced installation (grouting and alignment) and wiring cost.
- Larger pumps have a double volute design which prolongs seal and bearing life, and thereby lowers life cycle costs.
- Optimized impeller design increases efficiency and reduces NPSH required.
- Integrally cast diffuser vane reduces turbulence and need for suction guides.
- If supplied with base frame, no baseplate grouting is required.
- Point-loaded spring isolation base is available.
- Axially split, rigid coupling enables rapid mechanical seal access without motor removal. Additionally, no alignment is required between the pump and motor which eliminates laser alignment costs.
- With loose flanges it is possible to turn the flange a few degrees if the counter flange has been twisted during installation and/or welding. The flange can be rotated to meet the connection.



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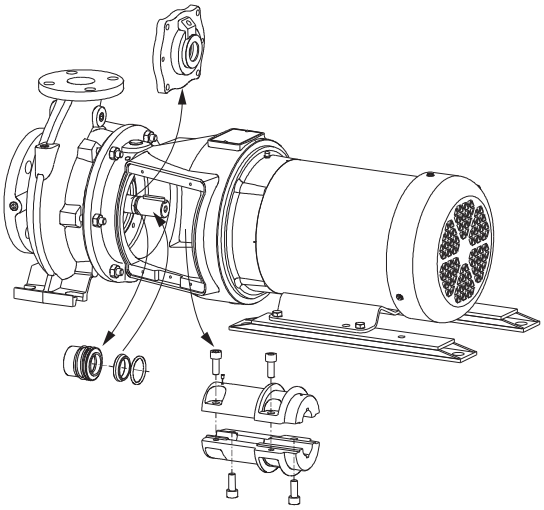
- Overall, the design is very service friendly, reduces installation working time and the result is reduced maintenance costs.



TM077934

*Pump design optimized for easy installation, easy service and low maintenance costs*

**Motor efficiency**

NBS pumps are all fitted with NEMA Premium Efficiency motors.

All motors in standard range are three-phase motors.

Alternative motors can be fitted upon request.

### Pumps with electronic speed control

TM077942

NBSE pumps are NBS pumps equipped with a Grundfos MLE motor. The MLE motor is a permanent magnet motor with a built in frequency converter and on-board controls. The on-board controls consist of advanced application software that provides the user with an all-in-one solution that is pre-programmed for electronic speed control of variable volume applications.

Electronic speed control provides continuous variable control of motor speed, enabling the automatic adaption of pump performance to a given requirement.

The Grundfos MLE utilizes a Permanent Magnet Synchronous Motor (PMSM) which carries an IE5 rating based on European Commission standards. This IE5 rating exceeds the current NEMA Premium Efficiency standard. A comparison of IE and NEMA ratings can be seen below:

| IEC | NEMA |
|---|---|
| IE5 | Ultra Premium * |
| IE4 | Super Premium/Enhanced-Premium * |
| IE3 | NEMA Premium |

* Common terminology. Not officially established by NEMA.

NBSE pumps with medium speed motors up to 15 hp (11 kW) and low speed motors up to 10 hp (7.5 kW) are fitted with Grundfos permanent-magnet ML motors that have motor efficiency class IE5 according to IEC 60034-30-2.

If a sensor is installed, NBSE pumps allow for any of these configurations or control methods:

- constant pressure
- constant temperature
- constant differential pressure
- proportional differential pressure
- constant flow rate
- constant differential temperature
- constant level
- constant curve
- constant other value.

### Why select an NBSE pump?

A pump with electronic speed control offers these benefits:

- energy savings
- increased comfort
- intelligent control and monitoring of pump performance
- communication with the pump
- easy installation and setup
- integrated solution
- customization
- low maintenance cost
- remote controllable.

For further information on electronic speed control, see section Speed-controlled pumps.

### Energy-optimized pumps

NBS pumps are Energy-optimized and comply with the Department of Energy (DOE) 2020 directive, in which most pumps are classified or graduated using Pump Energy Index (PEI). See section Pump Energy Index (PEI).

### Related information

*9. Speed-controlled pumps*

*17. Pump Energy Index (PEI)*

# 4. Product range

The tables on the following pages show the complete product ranges of NBS and NBSE pumps. The standard range has been combined on the basis of the following parameters:

**Pump**

- Pump housings have outlet flanges with nominal diameter from 1 1/4" to 10".
- Ductile steel versions have loose flanges. All others have fixed flanges.
- The pumps are available in mounting design B, C and F. Mounting design F has base frame and is available as an option. For further information, see section Mounting design.
- Support rails: NBS, NBSE pumps combine with many motor frame sizes and pump housings vary in size. The height difference between pump and motor are always leveled out by means of support rails under pump housing and motor, or under the motor only. Motors always have support rails to ensure easy service.

**Motor**

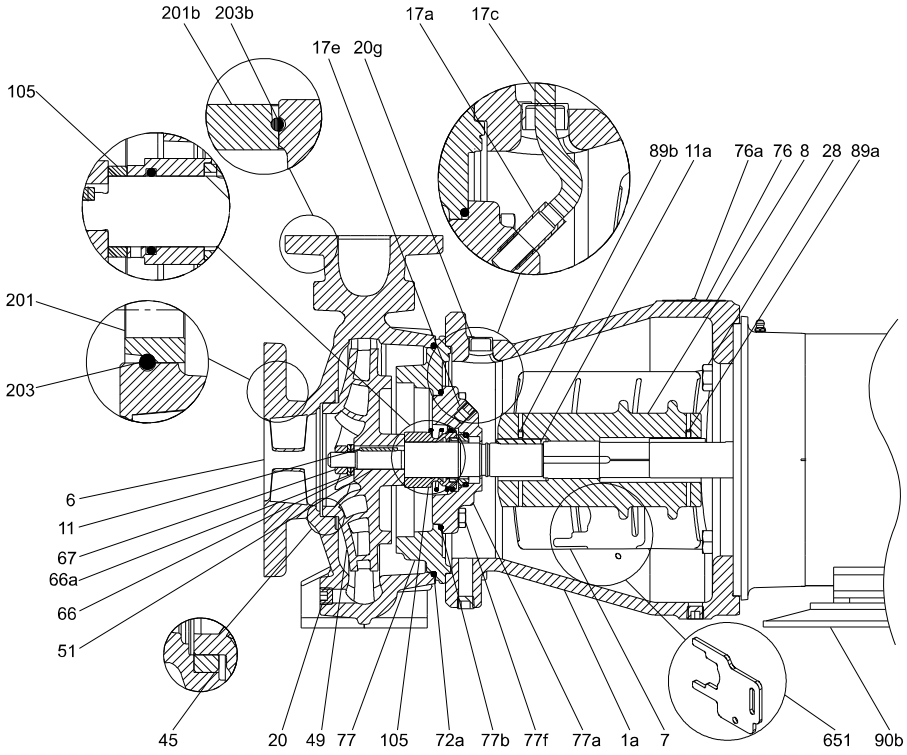
- Motors are for 60 Hz.
- NBS pumps are available with 2-, 4- and 6-pole motors; NBSE pumps with medium speed and low speed motors.
- The pumps are available with NEMA Premium Efficiency standard (IE3) and higher.
- Motors with power rating up to and including 5 hp (4 kW) are available for "low voltage"; motors as from 3 hp (2.2 kW) are available for "high voltage".
- Some pumps can be equipped with an MLE motor and integrated frequency converter.
- Some pumps can be connected to a Grundfos CUE external frequency converter.
- All pumps with non-E-motor can be connected to an external frequency converter.

**Related information**

*Mounting design*

# 6. Construction

## NBS, centre-line outlet

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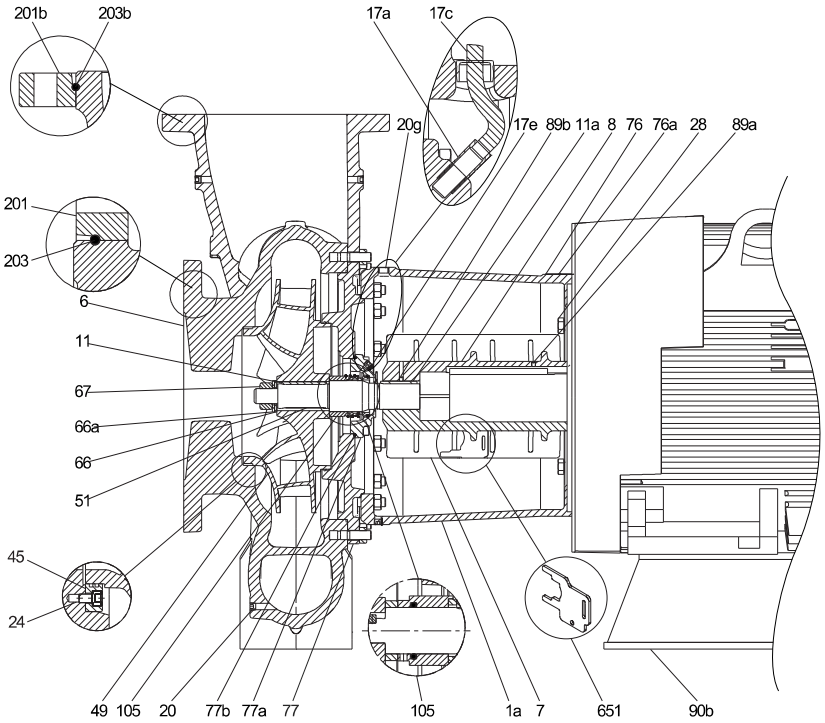
## NBS, tangential outlet

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Ingersoll Rand

# Oil-Free Scroll Air Compressor Systems

2-30 kW (3-40 hp)


Class 0

ISO 8573

Oil-Free Air

# Your Trusted Partner in Compressed Air

Staying ahead of your competition with advanced compressed air systems and services that boost productivity, lower operating expenses and extend equipment life is critical to your success.

No matter the industry or application, you can count on Ingersoll Rand as a trusted partner for oil-free scroll compressed air technologies and services. By focusing on you and your business, we provide collaborative solutions that make you successful, offering a total systems approach to maximize efficiency and performance.

## Take a Systems Approach

Delivering reliable oil-free compressed air to your facility goes well beyond the compressor itself. Optimize total cost of ownership (TCO) with a systems approach that delivers industry leading value through experienced installation and maintenance support, genuine OEM parts, accessories and consumables that extend the life of your system.

Your business will benefit from Ingersoll Rand's partnership. Through our extensive experience and global expertise we help to ensure reliability, lower maintenance costs and ease of serviceability.

### Let's Get Started Together

Throughout the entire lifecycle, our systems approach helps you achieve the lowest operating cost.

# When High Air Purity is a High Priority

There's a lot riding on the quality of your air. The presence of particles, condensation, oil and oil vapor in a compressed air system can lead to downtime, product spoilage and recall, damage to your brand reputation, or worse, harmed consumers and product liability.

### For reliability

A robust product and system design delivers top quality air, protecting sensitive downstream equipment, lowering maintenance and extending equipment life

### For productivity

The use of an oil-free Class 0 certified compressor guarantees contamination-free air, eliminating the risk of product spoilage and waste

### For serviceability

Our oil-free equipment is designed specifically to make maintenance easy by providing clear access to consumable components

### For lower cost of ownership

Higher initial costs for oil-free systems are more than offset by lower operational and maintenance costs over a system's life to maintain the highest air quality

Class 0
ISO 8573 Oil-Free Air

**ISO 8573-1 Air Quality Classes**

| Quality Class | Oil & oil vapor $mg/m^3$ |
|---|---|
| 0 | < 0.01 |
| 1 | 0.01 |
| 2 | 0.1 |
| 3 | 1 |
| 4 | 5 |

Class 0 is the most stringent air class defined by ISO 8573, part 1. Our W-Series oil-free scroll compressors are Class 0 for no oil content to ensure your air quality exceeds specifications.

## Oil-Free Scroll Compressors for Your Application

Ingersoll Rand offers a wide portfolio of reliable oil-free products that will adapt to your industry and application. We will assess and propose the best oil-free solution to increase the productivity of your installation, **providing zero risk of contamination of your final product.**

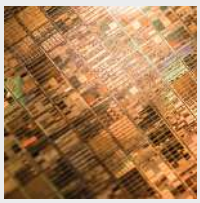

*Hospitals, Labs, Universities*


*Pharmaceutical, Biotech*


*Medical Devices, Plastics*


*Canning, Beverages, Brewery*


*Glass Manufacturing*


*Electronics, Semiconductor*


*Food Processing*


*Electronics Assembly*


*Textiles Industry*


*Bottling, Distillery*


*Printing Industry*


*Turf Management*

# AIR COMPRESSORS

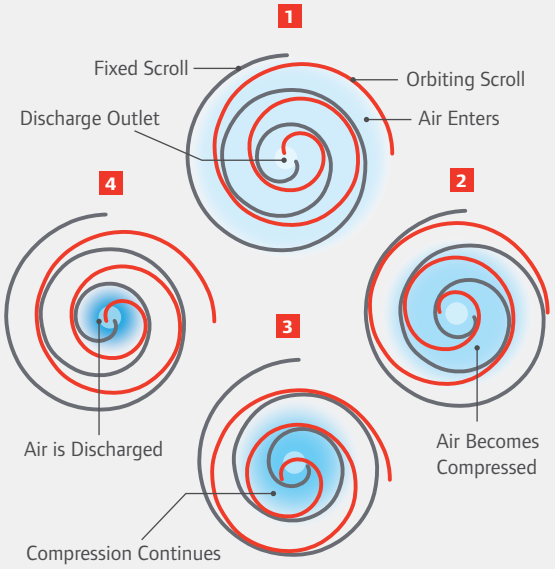


When quiet operation, low maintenance and a small footprint are critical, scroll air compressors are the smart choice. Their compact and innovative design make them ideal for many commercial applications where reliable, oil-free air is required.

## How Scroll Compressors Work

Scroll compressors use two interlacing spiral scrolls to pump, compress and pressurize air.

1. One scroll remains in a fixed position, while the other scroll orbits around it without rotating.
2. This motion traps the air in the pockets between the two scrolls, and pushes the air towards the center. As the air moves closer to the center, the pockets become smaller, and the air is compressed.
3. The process constantly repeats to maintain suction.
4. Once the air reaches the center, it is discharged through an outlet.




**NO OIL ANYWHERE!**

None in the compressor
None in the air
None in the condensate

## Scroll Compressor Advantages

| | |
|---|---|
| **Smaller footprint** | ▶ Takes up less floor space |
| **Fewer components** | ▶ Higher reliability, longer life, less maintenance |
| **Lower sound level** | ▶ Healthy work environment |
| **100% oil-free** | ▶ Can be used in any industry |
| **Use less consumables** | ▶ Longer service intervals and life |
| **No metal friction** | ▶ Less maintenance |
| **Zero emissions** | ▶ Meets goals for sustainability |
| **Fewer moving parts** | ▶ Lower vibration |

## 100% Oil-Free Air

The simple tip seal design of a scroll compressor ensures no metal-to-metal contact anywhere. Therefore, the technology does not require lubrication, ensuring high-quality, oil-free air.

**W-Series Tank-mounted, Unenclosed**

*W7.5ie*

*W4i*

**W22ie COMPRESSOR**

## Clean, Quiet and Efficient

Our scroll compressors pack tremendous value into a small, efficient package.

# What Makes Our Oil-Free Scroll Compressors Unique?

### Efficient Design and Control

Our scroll compressors deliver more flow per kW in most cases and reach pressures up to 145 psig in a single stage of compression. We achieve this efficiency through design features such as:

- **Start/stop control** ensures the compressor only delivers what is needed when it is needed
- **Nearly silent operation** using the quietest compression technology
- **Small radius rotation** provides virtually instant pressure when started

### Multiplex Design

The ability to multiplex the design for part-load efficiency means you can operate the exact number of compressors to match your demand.

### Cool Operation

The integral radial flow fan creates built-in intercooling without the need for additional auxiliary fan help.

### Microprocessor Control


Manages discharge pressure to meet your air demand, while measuring key operating parameters to reduce unwanted downtime (enclosed units only).

### Cooler Discharge Air Temperature

Aftercooler is included in all packages to cool the discharge air with forced air fans included in the enclosed models to insure heat is removed.

**Base-Mounted, Quiet-Enclosed**


*W7.5ie*

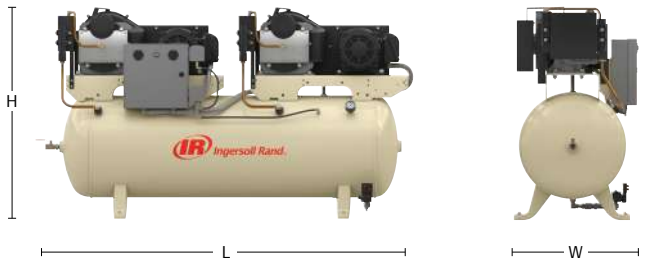

*W2.2i*

# W-Series Specifications

| W-Series – 60 Hz Performance (Base-Mounted, Quiet-Enclosed) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Model* | Max Pressure psig | Nominal Power hp | Air Flow** cfm | Connection Size NPT | Dimensions (LxWxH) in | Weight lb | Sound Level db (A) |
| W2.2i-A116 | 116 | 3 | 8.8 | 3/8" | 28 x 34 x 32 | 310 | 49 |
| W2.2i-A145 | 145 | 3 | 7.1 | | | 310 | 49 |
| W4i-A116 | 116 | 5 | 15.2 | | | 336 | 51 |
| W4i-A145 | 145 | 5 | 12.5 | | | 336 | 51 |
| W7.5ie-A116 | 116 | 10 | 30.4 | 1" | 34 x 38 x 61 | 825 | 53 |
| W7.5ie-A145 | 145 | 10 | 25.0 | | | 825 | 53 |
| W11ie-A116 | 116 | 15 | 45.6 | | | 965 | 56 |
| W11ie-A145 | 145 | 15 | 37.5 | | | 965 | 56 |
| W15ie-A116 | 116 | 20 | 60.8 | | | 1,125 | 58 |
| W15ie-A145 | 145 | 20 | 50.0 | | | 1,125 | 58 |
| W22ie-A116 | 116 | 30 | 91.2 | | 62 x 38 x 62 | 1,640 | 59 |
| W22ie-A145 | 145 | 30 | 75.0 | | | 1,640 | 59 |
| W30ie-A116 | 116 | 40 | 121.6 | | | 2,000 | 60 |
| W30ie-A145 | 145 | 40 | 100.0 | | | 2,000 | 60 |

| W Series – 60 Hz Performance (Tank-mounted, Unenclosed) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model* | Tank Size gal | Max Pressure psig | Nominal Power hp | Air Flow** cfm | Connection Size NPT | Dimensions (LxWxH) in | Weight lb | Sound Level db (A) |
| W2i-A116-30H | 30 | 116 | 3 | 8.8 | 3/4" | 46 x 22 x 35 | 320 | 72 |
| W2i-A145-30H | 30 | 145 | 3 | 7.1 | | | 320 | 72 |
| W4i-A116-60H | 60 | 116 | 5 | 15.2 | | 57 x 23 x 40 | 361 | 72 |
| W4i-A145-60H | 60 | 145 | 5 | 12.5 | | | 361 | 72 |
| W4i-A116-80H | 80 | 116 | 5 | 15.2 | | 70 x 23 x 40 | 446 | 72 |
| W4i-A145-80H | 80 | 145 | 5 | 12.5 | | | 446 | 72 |
| W5.5i-A116-120H | 120 | 116 | 7.5 | 23.1 | | 76 x 28 x 49 | 662 | 74 |
| W7.5i-A116-120H | 120 | 116 | 10 | 31.2 | | | 673 | 76 |
| W7.5ie-A116-80H | 80 | 116 | 10 | 30.4 | 1/2" | 70 x 25 x 40 | 647 | 75 |
| W7.5ie-A145-80H | 80 | 145 | 10 | 25.0 | | | 647 | 75 |
| W7.5ie-A116-120H | 120 | 116 | 10 | 30.4 | | 77 x 25 x 45 | 688 | 75 |
| W7.5ie-A145-120H | 120 | 145 | 10 | 25.0 | | | 688 | 75 |

* "i" models = simplex, "ie" models = multiplex for base-mount & duplex for tank-mount ** Air flow at 100 psig

# DRYERS, PARTS & SERVICES



Moisture and contamination in compressed air cause significant problems in equipment operation, such as rust, scale and clogged orifices that result in product damage or costly shutdowns. Making our air treatment equipment an integral component of your compressed air system will improve productivity, system efficiency and product or process quality.

## Modular Desiccant Dryers

Choose desiccant dryers when very low dew points are necessary for high-quality air and to prevent potential freeze-up.

- **Delivers high-quality air,** ISO Class 2 or optional Class 1 pressure dew point
- **Compact footprint and low noise operation w**(< 75 dBA), suitable for work environments
- **High-strength desiccant and durable components** provide extended life
- **Low pressure drop design** saves energy
- **Advanced microprocessor control** easy to use and maximizes uptime

## Refrigerated Dryers

Cost-effective refrigerated dryers provide clean, dry air for most industrial applications. Cycling dryers maximize energy savings, while non-cycling dryers minimize initial cost.

- **Dew points as low as 3°C (38°F),** meeting Class 4 requirements
- **Corrosion-free heat exchanger design** for reliable operation
- **Intuitive microprocessor control** for easy operation
- **Compact design** for easy serviceability

## OEM Parts and Services

Ingersoll Rand is your trusted partner for the long haul. Our services include skilled project management and installation for start-up, system expansion or decommissioning, as well as flexible maintenance programs that meet your specific requirements. And our genuine OEM parts ensure that your compressor is running reliably and efficiently.

### Installation

- Project management services

- SimplAir® piping systems

- Air system accessories

### Maintenance Programs

PackageCARE™ We Protect You

- PackageCARE™ full risk transfer

PlannedCARE™ We Help You

- PlannedCARE™ planned maintenance

PartsCARE™ We Enable You

- PartsCARE™ parts and assistance

### Genuine OEM Parts

- Filters (annually)

- Tip seals and grease (2-4 years*)

- Replacement airends (4-8 Years*)

*Part life depends on application and use—higher pressure designs will require maintenance sooner.

Ingersoll Rand

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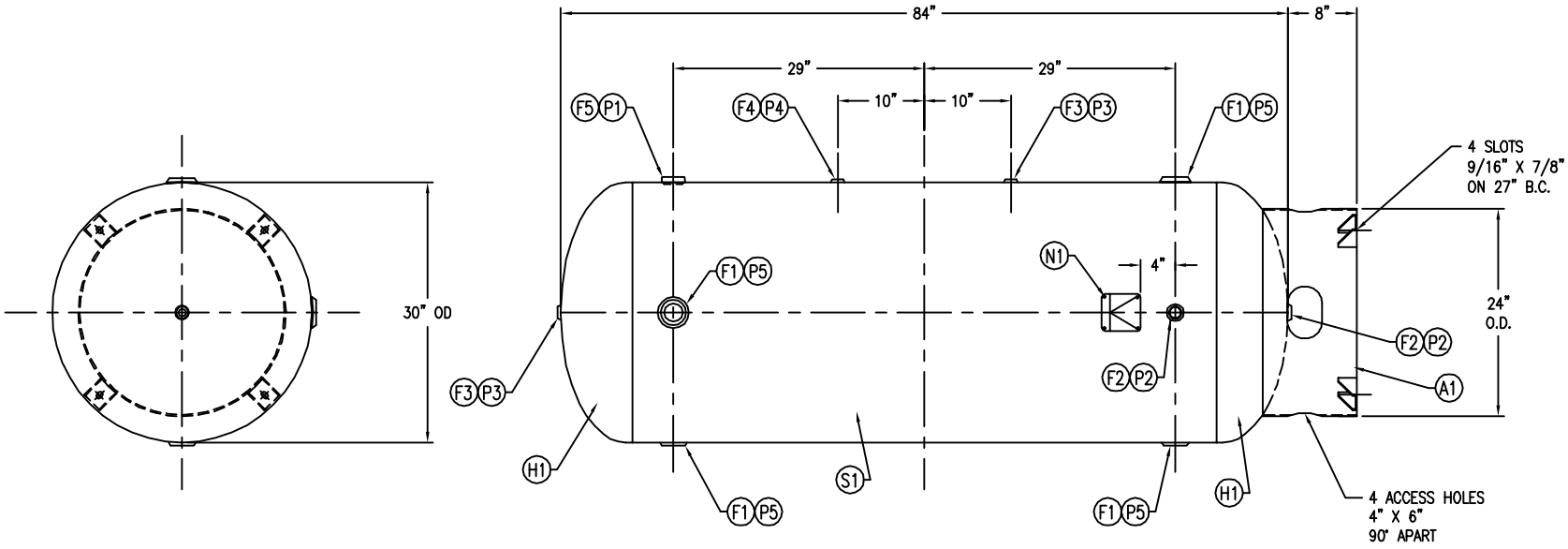
We are committed to using environmentally conscious print practices.

 IRITS-1118-100 0819

CO DA _____ APPROVED _____
RELEASED FOR PRODUCTION
Q.C. _____ DATE _____

| FIND NO. | NPT SIZE |
|---|---|
| F1 | 2 |
| F2 | 1 |
| F3 | 1/2 |
| F4 | 1/4 |
| F5 | 1-1/2 |

| NO. | QTY | PART NO. | DESCRIPTION | |
|---|---|---|---|---|
| H1 | 2 | | HEAD: | SA-414-G |
| S1 | 1 | | SHELL: | SA-414-G |
| F1 | 4 | | FLANGE: 2 NPT RAD. | SA181-70 |
| F2 | 2 | | FLANGE: 1 NPT | SA181-70 |
| F3 | 2 | | FLANGE: 1/2 NPT | SA181-70 |
| F4 | 1 | | FLANGE: 1/4 NPT | SA181-70 |
| F5 | 1 | | FLANGE: 1.1/2 NPT RAD | SA181-70 |
| A1 | 1 | A85002 | BASERING ASSY FOR 30" TANK | AP.G |
| N1 | 1 | | NAME PLATE: ASME / NB | AP.G |




| SYM | DATE | BY | REVISION | APP |
|---|---|---|---|---|
| A | | EGB | | TA |
| 1 | | SN | | LB |
| 2 | | JC | | JC |
| 3 | | JC | | |

NOTES

SPECIFICATIONS

O.D. 30 LGTH. 84 SH.
MAWP 200 PSI @ 400 °F HD.
RT- MDMT °F@ PSI GAL. 240 S.A. 59
EXMT TEST WT. 670# CU.FT. 32.16
XRAY CORR ALW SH HD
CRN -- CODE ASME / NB
PER DATE OF DWG/LAST REV

WELD DETAILS: M-1932
STD. TOLERANCES (UNLESS OTHERWISE NOTED): M-2461

Q:\3000\

MANCHESTER TANK

VERTICAL AIR RECEIVER
240 GALLON

| DRAWN BY | DATE | SCALE: NONE |
|---|---|---|
| LB | | |
| APP. BY | DATE | DRAWING NO. |
| AS | | 302428 |

TECHNICAL BULLETIN

D-TB
06-12

# MODEL D

## PRESSURE REDUCING REGULATOR

The Model D is Cashco's primary general service, self-contained, pressure reducing regulator. Unit handles inlet pressures up to 400 psig (27.6 Barg) and outlet pressures from 2-250 psig (.14-17.2 Barg) in multiple spring ranges. Model D is utilized for the majority of industrial pressure reducing applications.

**MODEL D**

### FEATURES

**Versatile:** Five body materials and twenty eight trim material combinations to select from.

**Tight Shutoff:** Composition seats of V-TFE, NBR or EPR available.

**Capacity:** Handles mid-range flow rates on a line size basis.

**Pressure Drop:** Handles mid-range pressure drops while maintaining good stability. Optional Stabilizer provides up to 350 psid (24.2 Bard) capability for gaseous service.

**Flow-to-Close Plug:** Incorporates the typical reducing regulator internal design.

**Incorporated Cylinder:** Plug is guided through its travel by the cylinder, which also serves to block harmful debris from entry to the seating surfaces.

**Overpressure Travel Stop:** In the event of downstream overpressurization, diaphragm over-travel is restricted by mechanical stops.

### APPLICATIONS

Used in all types of fluids, including cryogenic liquids and gases, sour gas, industrial gases, chemicals, as well as the common industrial fluids - water, oil, steam and compressed air.

# STANDARD/GENERAL SPECIFICATIONS

**Body Sizes:** 3/8", 1/2", 3/4", 1" (DN10,15, 20, 25). **For 1-1/2" & 2" (DN40 & 50) sizes, see DL-TB.**

**End Connections:**
Standard: NPT female.
Opt-30: Weld-on 150# (PN20) or 300# (PN50) RF flanges.
Opt-31: BSPT - Tapered Thread female,
Opt-31P: BSPP-Parallel Thread female.
Opt-32: Extended Nipples.

**Body/Spring Chamber/Body Cap Material Combinations:**
CI/CI/DI, CI/BRZ/DI, CI/CS/DI, CS/CI/SST, BRZ/BRZ/BRZ, SST/CI/SST, CS/CS/SST, BRZ/CI/BRZ, SST/CS/SST, SST/SST/SST
CI = Cast grey iron
DI = Ductile iron
CS = Cast carbon steel
SST = Cast stainless steel
BRZ = Cast bronze
See Table 1 for materials specifications.

**Inlet Design Pressure:**

| Body Material | Max Pressure | |
|---|---|---|
| | psig | (Barg) |
| CI | 250 | (17.2) |
| CS, SST, BRZ | 400 | (27.6) |

See Table 1.

**Outlet Design Pressure:**

| Body Material | Max Pressure | |
|---|---|---|
| | psig | (Bard) |
| CI | 175 | (12.1) |
| CS, SST | 300 | (20.7) |
| BRZ | 400 | (27.6) |

See Table 1.

**Temperature:** See Table 1.

**Outlet Pressure:** Standard: 2-150 psig (.14-10.3 Barg); in four range springs. See Tables 1 and 2.
Opt-80: 100-250 psig (6.9-17.2 Barg) spring range. BRZ body & spring chamber material only.

**Pressure Drop:** Standard: Up to 150 psid (10.3 Bard). Dependent on range spring selection; See Table 2a.
Opt-4: Up to 350 psid (24.2 Bard), gaseous service only.
Opt-20: Up to 250 psid (17.2 Bard) See Table 2b.

**Trim Designs:** Metal seated or composition seated, brass, monel, or SST materials. Metal or composition diaphragms. See Tables 3 and 4.

**Capacities:** Up to 3.6 Cv; see Table 7 for Cv vs. outlet pressure vs. body size vs. diaphragm material. Flow tables —
Water - Table 8.
Compressed Air - Table 9.
Steam - Table 10.

For wide open Cv's, see Table 6 ; use for safety relief sizing.

**Seat Leakage:** Meets ANSI/FCI 70-2.
Standard: Metal seated, Class IV.
Optional: Composition (soft) seated Class VI.

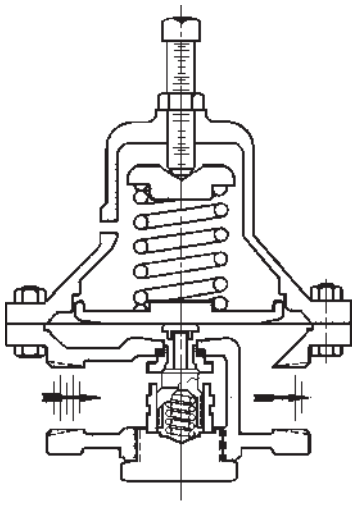


**Figure 1**: Metal Seat Design

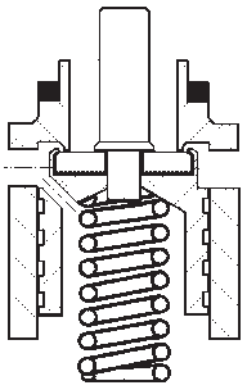


**Figure 2**: Composition Seat Design

821

**Gaskets:** Standard: Graphite/NBR.
- Cylinder **&** Diaphragm Gaskets.

**NOT SUITABLE FOR OXYGEN SERVICE.**

(**NOTE:** Composition diaphragms do not use a diaphragm gasket.)
Alternate Material: See Opt-45.
Cryogenic: See Opt-5 and -36.

**Range Springs:** Standard: Epoxy coated steel.
LCC Body material: SST.
Cryogenic: SST.

**Flange Bolting:** Standard: Zinc plated, heat treated steel.
LCC Body material: SST.
Cryogenic Construction: SST.

**Painting:** Standard: All non-corrosion resistant portions to be painted with corrosion resistant epoxy paint per Cashco Spec #S-1606.

Alternate: See Opt-95 or -95OS.

## OPTION SPECIFICATIONS

**Option -3:** HANDWHEEL & LOCKING LEVER. Utilize when $P_2$ pressure setting changes are frequent.

**Option -4:** STABILIZER. Recommended for gaseous service only. Stabilizer provides added guiding to maximize stability for internal trim, allowing improved pressure drop capability. Stabilizer materials are SST/TFE. For use with all trim designation numbers. See Table 2 for application recommendations.

**Option -5:** BRZ CRYOGENIC CONSTRUCTION. BRZ/BRZ body/spring chamber materials. NPT end connections. BO, and B5 trim selections only. SST flange bolting and range spring; remaining parts of brass or bronze materials. TFE-silicate gaskets. 1/8" (DN6) NPT tapped spring chamber vent/purge connection. Drilled condensate drain hole near adjusting screw. Cleaned and packaged for oxygen service per Cashco cleaning specification #S-1134. Applicable temperature range -325° to +150° F (-198° to +66° C). **NOTE:** Design requires that spring chamber be mounted pointing downwards in a horizontal pipe. See Figure 3.

**Option -20:** AIR PRESSURE LOADED. No range spring. Use when the outlet pressure is frequently changed. Composition Diaphragm ONLY. Incorporates a cast bronze or cast steel loading chamber with 1/4" NPT loading connection for external pressure loading up to 160 psig (11 Barg). Sizes 3/8" thru 1" only. Available in Brass and SST Trim with Monel pusher plate.

**Option -25:** TAPPED VENT. 1/8" (DN6) NPT tapped opening in spring chamber for piping vent to remote location, in the event of diaphragm failure.

**Option -25P:** PLASTIC RAIN PROOF BUG VENT. (includes Opt-25).

**Option -25S:** SST RAIN PROOF BUG VENT: (includes Opt-25).

**Option -30:** FLANGED END CONNECTIONS. CS or SST body materials only. Flange and pipe nipple materials of same general chemistry as body material. Short-threaded nipples seal welded at body; nipples socket welded at flange. Available in 150# RF or 300# RF flanges only. Not available 3/8" (DN10) body size.

**NOTES:**
1. The body P vs.T ratings of Table 1 are the limiting variables for flanged end connections, unless further restricted by ASME B16.5.
2. No post-weld stress relieving performed.

**Option -31:** BSPT END CONNECTIONS. British Standard Tapered Pipe threads per ISO 7/1; used as an alternate to NPT ends. Not available 3/8" (DN10) body size.

**Option-31P:** BSPP END CONNECTIONS. British Standard Parallel Pipe threads per ISO 7/1; used as an alternate to NPT ends. Not available 3/8" (DN10) body size.

**Option -32:** EXTENDED NIPPLES. Schedule 80 plain end extension nipples ava[illegible] for carbon steel or 316 SST b[illegible]

Nipples of same basic material as body. Nipples are seal weld after screwing into body. **NOTE:** Used where welded connections are required and in lieu of socket weld ends. Not available 3/8" (DN10) body size.

**Option -36:** SST CRYOGENIC CONSTRUCTION. Same specifications as Option -5, except:

a. For SST/SST body/spring chamber materials.
b. S1, and S36 only available trim selections.

**Option -37:** ALL SST/CLEAN UNIT FOR LIQUIDS & GASES. 1/2", 3/4" and 1" (DN 15,20, & 25) NPT sizes only. Uses 316 SST body and spring chamber, S6 trim only. SST T-handle, spring button, spring, pressure plate, nuts and bolts. All wetted and external castings are electropolished and unit is cleaned to Cashco Specification #S-1576. Suitable for fluids of -20 to 100° F (-29 to 38° C); inlet pressures to 250 psig (17.2 Barg) and outlet pressures adjustable from 2 to 80 psig (.14 to 5.5 Barg) with multiple range springs. Complete with 1/4" (DN8) NPT output gauge connection body tap and 1-1/2" (40 mm) diameter SST pressure gauge, 0-100 psig (0-6.9 Barg).

**Option -37S:** ALL SST/CLEAN UNIT FOR STEAM. Similar to Option -37, except uses S1 trim with graphite diaphragm gasket. Does not include gauge connection or gauge. Suitable for steam/condensate service up to 350° F (177° C), inlet pressures to 100 psig (6.9 Barg). Outlet pressures adjustable from 2 to 80 psig (.14 to 5.5 Barg) with multiple range springs.

**Option -40:** CS NACE CONSTRUCTION. Internal wetted portions meet NACE standard MR0175, when the exterior of the regulator is not directly exposed to a sour gas environment, buried, insulated or otherwise denied direct atmospheric exposure. CS/CS body/spring chamber material with S40 and S40T only trim. (Alternate LCC body/spring chamber material with S40B and S40C only trim.) Available all sizes, except 3/8" (DN10). Opt-30 and -32 require post-weld stress relieving by heat treating.

**Option -40SST:** SST NACE CONSTRUCTION. Same as Opt-40, except uses SST/SST body/spring chamber construction.

**Option -45:** TFE GASKETS. Primarily for oxygen service. Utilizes TFE silicate diaphragm and cylinder gasket over standard gaskets. Temperature range -20° to +400° F (-29° to +205° C).

**Option -55:** SPECIAL CLEANING. SST and BRZ body materials ONLY. Cleaning per Cashco Spec. #S-1134 for oxygen service. **NOTE:** Design Pressure Rating shall not exceed 290 psig (20.0 Barg) when body material is SST and process medium is oxygen.

**Option -56:** SPECIAL CLEANING. All body materials. Cleaning per Cashco Spec. #S-1542. Cleaning identical to that of Opt-55, but not labeled for application in oxygen service. Not suitable for oxygen service.

**Option -80:** HIGH OUTLET PRESSURE. BRZ spring chamber only. **(NOTE:** Taller spring chamber; see dimensions tables.) Spring covers 100-250 psig (6.9-17.2 Barg) pressure range. Apply with BRZ, body materials only and metal diaphragm trims only.

**Option -85:** 1/8" (DN6) NPT OUTPUT GAUGE CONNECTION BODY TAP.

**Option -95:** EPOXY PAINT. Special epoxy painting of all non-corrosion resistant external surfaces per Cashco Spec #S-1547.
Utilized in harsh atmospheric conditions.

**Option -95OS:** EPOXY PAINT. Special epoxy painting of all non-corrosion resistant external surfaces per Cashco Spec #S-1687 for OFFSHORE installations.

# TECHNICAL SPECIFICATIONS

## TABLE 1
## DESIGN PRESSURE - TEMPERATURE MATERIAL SPECIFICATIONS

| STANDARD CONSTRUCTION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | ENGLISH | | | | METRIC | | | |
| Material Specifications Body - Spring orLoading Chamber (Body Cap) | | Inlet | | Outlet | | Inlet | | Outlet | |
| | | Pressure | Temperature† | Pressure | Temperature† | Pressure | Temperature† | Pressure | Temperature† |
| Descript (Abbr.) | ASTM No. | psig | °F | psig | °F | Barg | °C | Barg | °C |
| CI - CI (DI) ‡ | A126, Class B (A395) | **250** | -20 to +400 | 175 | -20 to +400 | 17.2 | -29 to +205 | 12.1 | -29 to +205 |
| CI- BRZ (DI) | A126, Class B - B62, Alloy C83600(A395) | | | | | | | | |
| CI- CS (DI) | A126, Class B - A216, Gr. WCB (A395) | | | | | | | | |
| BRZ- CI (BRZ) | B62, Alloy C83600- A126, Class B (B584) | 250 | -20 to +350 | 175 | -20 to +350 | 17.2 | -29 to +176 | 12.1 | -29 to +176 |
| CS CI (SST) | A216, Gr. WCB A126, Class B (A479 Alloy S31600/3) | **250** | -20 to +400 | 175 | -20 to +400 | 17.2 | -29 to +205 | 12.1 | -29 to +205 |
| SST CI (SST) | A351, Gr. CF8M A126, Class B (A479 Alloy S31600/3) | | | | | | | | |
| BRZ - BRZ (BRZ) | B62, Alloy C83600 (B584) | 400 | -20 to +200 | 400 | -20 to +200 | 27.6 | -29 to +94 | 27.6 | -29 to +94 |
| | | 390 | 300 | 390 | 300 | 26.9 | 149 | 26.9 | 149 |
| | | 315 | 350 | 315 | 350 | 21.7 | 176 | 21.7 | 176 |
| CS - CS ** (SST) | A216, Gr. WCB (A479 Alloy S31600/3) | 400 | -20 to +400 | 300 | -20 to +400 | 27.6 | -29 to +205 | 20.7 | -29 to +205 |
| SST - SST (SST) | A351, Gr. CF8M (A479 Alloy S31600/3) | 400 | -20 to +400 | 300 | -20 to +400 | 27.6 | -29 to +205 | 20.7 | -29 to +205 |
| SST CS (SST) | A351, Gr. CF8M A216, Gr. WCB (A479 Alloy S31600/3) | | | | | | | | |
| **Options -5 and -36 CRYOGENIC CONSTRUCTION** | | | | | | | | | |
| BRZ - BRZ (BRZ) | B62, Alloy C83600 (B584) | 400 | -325 to + 150 | 400 | -325 to +150 | 27.6 | -198 to +66 | 27.6 | -198 to +66 |
| SST - SST (SST) | A351, Gr. CF8M (A479 Alloy S31600/3) | 400 | -325 to +150 | 300 | -325 to +150 | 27.6 | -198 to +66 | 20.7 | -198 to +66 |

**NOTE:** Certification of material chemical and physical properties are not available for CI or DI or for diaphragm sheet material.
‡ See Table 5 restrictions for use with Fuel Oil and Hydrocarbon Gas or Liquid applications.
†Design temperature range of the regulator may be limited by trim selection. See Table 3, 4a and 4b.
****** Alternate material - LCC - LCC Steel - ASTM A352 Gr. LCC minimum temperature -50 °F (-46 °C) with S1 or S36 Trim.

## TABLE 2a
## RANGE SPRINGS WITH RECOMMENDED PRESSURE DROPS

| Construction | Range spring | | Recommended Max Pressure Drop* | |
|---|---|---|---|---|
| | psig | (Barg) | psid | (Bard) |
| Standard or Cryogenic | 2-15 | (.14-1.0) | 100 | (6.9) |
| | 10-40 | (.69-2.8) | 125 | (8.6) |
| | 30-80 | (2.1-5.5) | 150 | (10.3) |
| | 70-150 | (4.8-10.3) | | |
| w/Opt-80 | 100-250 | (6.9-17.2) | | |
| w/Stablizer Opt-4 | 2-15 | (.14-1.0) | 200 | (13.8) |
| | 10-40 | (.69-2.8) | 350 | (24.2) |
| | 30-80 | (2.1-5.5) | | |
| | 70-150 | (4.8-10.3) | | |
| w/Opt-4+80 | 100-250 | (6.9-17.2) | | |

***NOTES:**
1. For steam service, B0 & B1 trim designation nos. are limited to 100 psid (6.9 Bard).
2. Opt.-4 Stabilizer is recommended only for gaseous service with critical or "choked" flow. This flow occurs when $P_{1\,Abs} / P_{2\,Abs}$ is greater than 2.0. Otherwise use Standard or Cryogenic construction.

## TABLE 2b
## OPTION - 20
## MAX LOADING PRESSURE

| Diaphragm Material | Body Size | | | |
|---|---|---|---|---|
| | 3/8" - 1/2" | | 3/4" - 1" | |
| | psig | (Barg) | psig | (Barg) |
| FKM | 100 | (6.9) | 200 | (13.8) |
| Gylon | 50 | (3.4) | 50 | (3.4) |
| FK | 250 | (17.2) | 250 | (17.2) |
| Neoprene | 100 | (6.9) | 100 | (6.9) |
| EPDM | 100 | (6.9) | 200 | (13.8) |

## TABLE 3
## BRASS TRIM MATERIAL COMBINATIONS

| PART | BRASS TRIM # | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | METAL SEAT | | COMPOSITION SEAT | | | | | |
| | **B0[1]*** | **B1 *** | **B2** (Air/$H_2$0) | **B3** | **B4** | **B5[1]** (Oxygen) | **BB** (Fuel-Oils) | **BJ** |
| Diaphragm | Phos Brz | 302 SST | BC | BC | FKM | Phos Brz | NBR | FK |
| Cylinder | Brass | Brass | Brass | Brass | Brass | Brass | Brass | Brass |
| Piston | Brass | Brass | Brass | Brass | Brass | Brass | Brass | Brass |
| Seat Disc | None (Metal) | None (Metal) | NBR | V-TFE | V-TFE | V-TFE | NBR | V-TFE |
| Piston Spring | 302 SST | 302 SST | Phos Brz | Phos Brz | 302 SST | Phos Brz | Phos Brz | Phos. Brz. |
| Pusher Plate | Brass | Brass | Brass | Brass | Brass | Brass | Brass | Brass |
| Temperature Range | -20 to +200°F<br>-29 to +94°C | -20 to +400°F<br>-29 to +205°C | -20 to +180°F<br>-29 to +83°C | -20 to +180°F<br>-29 to +83°C | -20 to +300°F<br>-29 to +149°C | -20 to +200°F<br>-29 to +94°C | -20 to +180°F<br>-29 to +83°C | -20 to +350°F<br>-29 to +177°C |

* Max pressure drop = 100 psid (6.9 Bard).
[1] For cryogenic applications; B0 or B5 trim designations ONLY are allowed for -325° to +150°F(-198° to +66°C) range.

## TABLE 4(a)
## MONEL & STAINLESS STEEL TRIM MATERIAL COMBINATION – METAL SEAT

| PART | STAINLESS STEEL TRIM # | | | | | | | MONEL TRIM # |
|---|---|---|---|---|---|---|---|---|
| | **S0** | **S1[1]** | **S2** (Steam) | **S2N** | **SG** | **S40 (NACE)** | **S40B (NACE)** | **M1** |
| Diaphragm | TFE Coated 302 SST | 302 SST | 302 SST | BC | Gylon | BC | BC * | 302 SST |
| Cylinder | 316 SST | 316 SST | 416 SST | 416 SST | 416 SST | 316 SST | 316SST | Monel |
| Piston | 316 SST | 316 SST | 416 SST | 416 SST | 416 SST | 316 SST | 316SST | Monel |
| Seat Disc | None (Metal) | None (Metal) | None (Metal) | None (Metal) | None (Metal) | None (Metal) | None (Metal) | None (Metal) |
| Piston Spring | 302 SST | 302 SST | 302 SST | 302 SST | 302 SST | Inconel X-750 | Inconel X-750 | 302 SST |
| Pusher Plate | 316 SST | 316 SST | 316 SST | 316 SST | Monel | 316 SST | 316SST | 316 SST |
| Temperature Range | -20 to +400°F<br>-29 to +205°C | | | -20 to +180°F<br>-29 to +83°C | -20 to +400°F<br>-29 to +205°C | -20 to +180°F<br>-29 to +83°C | -50 to+250°F<br>-46 to +121°C | -20 to +400°F<br>-29 to +205°C |

[1] For cryogenic applications; S1 and S36 trim designations are ONLY allowed for -325° to +150°F (-198° to +66°C) range.
Cashco Inc. does not recommend metal seated trim on any service where the flow will be dead ended down stream of the pressure reducing regulator
***** Special BC Material for Low Temperature.

## TABLE 4(b)
## MONEL & STAINLESS STEEL TRIM MATERIAL COMBINATION – COMPOSITION (SOFT) SEAT

| PART | STAINLESS STEEL TRIM # | | | | | | | | | | | MONEL TRIM # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S3** | **S4** | **S4N** (Air/$H_2$0) | **S6** (Hot Air/$H_2$0) | **S7** | **S9** | **S36[1]** | **S40T (NACE)** | **S40C (NACE)** | **SB** | **SJ** | **M36** |
| Diaphragm | BC | BC | BC | EPDM | FKM | TFE Coated 302 SST | 302 SST | FKM | BC * | NBR | FK | 302 SST |
| Cylinder | 316 SST | 416 SST | 416 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 416 SST | 316 SST | Monel |
| Piston | 316 SST | 416 SST | 416 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 416 SSt | 316 SSt | Monel |
| Seat Disc | V-TFE | V-TFE | NBR | EPR | V-TFE | V-TFE | V-TFE | V-TFE | V-TFE | NBR | V-TFE | V-TFE |
| Piston Spring | 302 SST | 302 SST | 302 SST | 302 SST | 302 SST | 302 SST | 302 SST | Inconel X-750 | Inconel X-750 | 302 SST | 302 SST | 302 SST |
| Pusher Plate | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST | 316 SST |
| Temp Range | -20 to +180°F<br>-29 to +83°C | | | -20 to +300°F<br>-29 to +149°C | | -20 to +400°F<br>-29 to +205°C | | -20 to +300°F<br>-29 to +149°C | -50 to+250°F<br>-46 to +121°C | -20 to +180F<br>-29 to +83C | -20 to +350°F<br>-29 to +177°C | -20 to +400°F<br>-29 to +205°C |

[1] For cryogenic applications; S1 and S36 trim designations are ONLY allowed for -325° to +150°F (-198° to +66°C) range.
***** Special BC Material for Low Temperature.

**= Most common use - See Table 5**

**ABBREVIATIONS**
NBR = Buna-N BC = Neoprene EPDM = Ethylene Propylene Diene EPR = Ethylene Propylene TFE = Polytetrafluoroethylene
FK = Fluorosilicone FKM = Fluorocarbon elastomer V-TFE = Virgin TFE Phos BRZ = Phosphor Bronze

## TABLE 5
## APPLICATIONS

| FLUID | RECOMMENDED CONSTRUCTION | TRIM DESIGNATION # |
|---|---|---|
| Air or Inert Gases | Composition Seat and Diaphragm<br>Metal Seat and Composition Diaphragm<br>Metal Seat and Diaphragm | **B2**, B3, B4, SB**, S4N**<br>S2N<br>B0, B1 |
| Oxygen | Composition Seat and Diaphragm<br>Composition Seat and Metal Diaphragm<br>Metal Seat and Diaphragm | B4, BJ, S7, SJ<br>**B5**, S36<br>S1 |
| Oxygen above 290 psid | Metal Seat and Diaphragm<br>TFE Seat and Metal Diaphragm | M1<br>M36 |
| Chemicals | Metal Seat and Diaphragm<br>Metal Seat and Composition Diaphragm<br>Composition Seat and Diaphragm<br>TFE seat and Metal Diaphragm | S1, S2, S0<br>S40<br>SB, S3, S4, S4N, S6 or<br>S40T, S9 |
| Sour Gas | Metal Seat and Composition Diaphragm<br>Composition Seat and Diaphragm | S40 (* S40B)<br>S40T (* S40C,) |
| Cryogenic Gas or Liquids | TFE Seat and Metal Diaphragm<br>Metal Seat and Diaphragm | **B5** or **S36**<br>B0 or S1 |
| Fuel Oil‡ | Composition Seat and Diaphragm | **BB**, B4, SB**,** S3, S4, or S4N |
| Hydrocarbon Gas or Liquids‡ | Composition Seat and Diaphragm | BB, B3, B4, S3, S4, or S4N |
| Saturated Steam,<br>Low Pressures - up to 50 psig (3.4 Barg) | Metal Seat and Diaphragm<br>Metal Seat and Composition Diaphragm<br>Composition Seat and Diaphragm | **S2**, B0, or S1<br>SG<br>S6 |
| Saturated Steam, Pressures up<br>to 100 psig (6.8 Barg)<br>50 psid (3.4 Barg) | Metal Seat and Diaphragm<br>Metal Seat and Composition Diaphragm | **S2**, B0, B1 or S1<br>SG |
| Steam Pressures above 100 psig (6.9 Barg)<br>Saturated or Superheated | Metal Seat and Diaphragm | **S2** or S1 |
| Water and Condensate<br>Low Temperature – 32–180°F (0–83°C) | Composition Seat and Diaphragm<br>Metal Seat and Composition Diaphragm<br>Metal Seat and Diaphragm | **B2**, B3, BB, SB, S3, S4, or<br>S6, S4N S2N<br>S1, S2 |
| Water and Condensate<br>High Temperature – 180–300°F (83–149°C) | Metal Seat and Diaphragm | S1 or S2 |

**NOTE 1:** Trim Designation Nos. in "boldface" are the most commonly used. Cashco, or its representatives may make recommendations or suggestions as to the suitability of certain trims for specific services. These are trims that have been used successfully in the past in similar applications. However, the user has final responsibility for materials selected.

**NOTE 2:** Cashco, Inc. does not recommend metal seated trim on any service where the flow will be dead ended down stream of the pressure reducing regulator.

‡ In accordance with ASME B31.3 “process piping”, do not use Cast Iron Body for hydrocarbon or flammable fluid service with inlet pressures greater than 150 psig (10.3 Barg) or temperatures greater than 300° F (149° C).

* NACE Trims for use w/ LCC Body Material Temperature Range -50 to +250°F (-46 to +121°C).

## TABLE 6
## MAXIMUM $C_v$ WITH PLUG WIDE OPEN
## (Use for Relief Valve Sizing)

| Body Size | | Cv |
|---|---|---|
| Inch | (DN) | |
| 3/8" | (10) | 1.8 |
| 1/2" | (15) | 1.8 |
| 3/4" | (20) | 3.7 |
| 1" | (25) | 4.0 |
| **METRIC CONVERSION FACTOR: Cv / 1.16 =kv** | | |

# TABLE 7
# CAPACITY - Cv
# AT FLOWING PRESSURE
# (FL = 0.95)

| METAL DIAPHRAGM | | | | | | | |
|---|---|---|---|---|---|---|---|
| Flowing Pressure | | 3/8" (DN10) Body | | | 1/2" (DN15) Body | | |
| | | %Droop | | | %Droop | | |
| psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% |
| 5 | (0.3) | 0.11 | 0.22 | 0.34 | 0.11 | 0.22 | 0.34 |
| 10 | (0.7) | 0.22 | 0.45 | 0.67 | 0.22 | 0.45 | 0.67 |
| 15 | (1.0) | 0.34 | 0.67 | 1.01 | 0.34 | 0.67 | 1.01 |
| 25 | (1.7) | 0.28 | 0.57 | 0.85 | 0.28 | 0.57 | 0.85 |
| 35 | (2.4) | 0.40 | 0.79 | 1.19 | 0.40 | 0.79 | 1.19 |
| 50 | (3.4) | 0.26 | 0.52 | 0.77 | 0.26 | 0.52 | 0.77 |
| 75 | (5.2) | 0.39 | 0.77 | 1.16 | 0.39 | 0.77 | 1.16 |
| 100 | (6.9) | 0.28 | 0.56 | 0.83 | 0.28 | 0.56 | 0.83 |
| 135 | (9.3) | 0.37 | 0.76 | 1.12 | 0.37 | 0.76 | 1.12 |
| 150 | (10.3) | 0.42 | 0.83 | 1.25 | 0.42 | 0.83 | 1.25 |
| 175 | (12.1) | 0.53 | 1.06 | 1.59 | 0.53 | 1.06 | 1.59 |
| 200 | (13.8) | 0.61 | 1.21 | 1.80 | 0.61 | 1.21 | 1.80 |
| 225 | (15.5) | 0.68 | 1.37 | 1.80 | 0.68 | 1.37 | 1.80 |
| 250 | (17.2) | 0.76 | 1.52 | 1.80 | 0.76 | 1.52 | 1.80 |

| COMPOSITION DIAPHRAGM | | | | | | | |
|---|---|---|---|---|---|---|---|
| Flowing Pressure | | 3/8" (DN10) Body | | | 1/2" (DN15) Body | | |
| | | %Droop | | | %Droop | | |
| psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% |
| 5 | (0.3) | 0.16 | 0.31 | 0.47 | 0.16 | 0.31 | 0.47 |
| 10 | (0.7) | 0.31 | 0.63 | 0.94 | 0.31 | 0.63 | 0.94 |
| 15 | (1.0) | 0.47 | 0.94 | 1.41 | 0.47 | 0.94 | 1.41 |
| 25 | (1.7) | 0.40 | 0.81 | 1.21 | 0.40 | 0.81 | 1.21 |
| 35 | (2.4) | 0.56 | 1.13 | 1.69 | 0.56 | 1.13 | 1.69 |
| 50 | (3.4) | 0.36 | 0.71 | 1.07 | 0.36 | 0.71 | 1.07 |
| 75 | (5.2) | 0.54 | 1.07 | 1.61 | 0.54 | 1.07 | 1.61 |
| 100 | (6.9) | 0.35 | 0.71 | 1.06 | 0.35 | 0.71 | 1.06 |
| 150 | (10.3) | 0.53 | 1.06 | 1.59 | 0.53 | 1.06 | 1.59 |
| 175 | (12.1) | 0.53 | 1.06 | 1.59 | 0.53 | 1.06 | 1.59 |
| 200 | (13.8) | 0.61 | 1.21 | 1.80 | 0.61 | 1.21 | 1.80 |
| 225 | (15.5) | 0.68 | 1.37 | 1.80 | 0.68 | 1.37 | 1.80 |
| 250 | (17.2) | 0.76 | 1.52 | 1.80 | 0.76 | 1.52 | 1.80 |

| METAL DIAPHRAGM | | | | | | | |
|---|---|---|---|---|---|---|---|
| Flowing Pressure | | 3/4" (DN20) Body | | | 1" (DN25) Body | | |
| | | %Droop | | | %Droop | | |
| psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% |
| 5 | (0.3) | 0.18 | 0.35 | 0.53 | 0.18 | 0.35 | 0.53 |
| 10 | (0.7) | 0.35 | 0.70 | 1.05 | 0.35 | 0.70 | 1.05 |
| 15 | (1.0) | 0.53 | 1.05 | 1.58 | 0.53 | 1.05 | 1.58 |
| 25 | (1.7) | 0.44 | 0.88 | 1.32 | 0.44 | 0.88 | 1.32 |
| 35 | (2.4) | 0.62 | 1.23 | 1.85 | 0.62 | 1.23 | 1.85 |
| 50 | (3.4) | 0.49 | 0.98 | 1.48 | 0.49 | 0.98 | 1.48 |
| 75 | (5.2) | 0.74 | 1.48 | 2.22 | 0.74 | 1.48 | 2.22 |
| 100 | (6.9) | 0.54 | 1.08 | 1.62 | 0.54 | 1.08 | 1.62 |
| 135 | (9.3) | 0.73 | 1.46 | 2.19 | 0.73 | 1.46 | 2.19 |
| 150 | (10.3) | 0.81 | 1.62 | 2.43 | 0.81 | 1.62 | 2.43 |
| 175 | (12.1) | 1.24 | 2.47 | 3.60 | 1.24 | 2.47 | 3.60 |
| 200 | (13.8) | 1.41 | 2.82 | 3.60 | 1.41 | 2.82 | 3.60 |
| 225 | (15.5) | 1.59 | 3.18 | 3.60 | 1.59 | 3.18 | 3.60 |
| 250 | (17.2) | 1.77 | 3.60 | 3.60 | 1.77 | 3.60 | 3.60 |

| COMPOSITION DIAPHRAGM | | | | | | | |
|---|---|---|---|---|---|---|---|
| Flowing Pressure | | 3/4" (DN20) Body | | | 1" (DN25) Body | | |
| | | %Droop | | | %Droop | | |
| psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% |
| 5 | (0.3) | 0.34 | 0.67 | 1.01 | 0.34 | 0.67 | 1.01 |
| 10 | (0.7) | 0.67 | 1.34 | 2.02 | 0.67 | 1.34 | 2.02 |
| 15 | (1.0) | 1.01 | 2.02 | 3.03 | 1.01 | 2.02 | 3.03 |
| 25 | (1.7) | 0.89 | 1.79 | 2.68 | 0.89 | 1.79 | 2.68 |
| 35 | (2.4) | 1.25 | 2.51 | 3.60 | 1.25 | 2.51 | 3.60 |
| 50 | (3.4) | 1.15 | 2.31 | 3.60 | 1.15 | 2.31 | 3.60 |
| 75 | (5.2) | 1.73 | 3.20 | 3.60 | 1.73 | 3.20 | 3.60 |
| 100 | (6.9) | 1.03 | 2.06 | 3.60 | 1.03 | 2.06 | 3.60 |
| 150 | (10.3) | 1.54 | 3.09 | 3.60 | 1.37 | 2.74 | 3.60 |
| 200 | (13.8) | 1.56 | 3.13 | 3.60 | 1.56 | 3.13 | 3.60 |
| 225 | (15.5) | 1.76 | 3.50 | 3.60 | 1.76 | 3.50 | 3.60 |
| 250 | (17.2) | 1.95 | 3.60 | 3.60 | 1.95 | 3.60 | 3.60 |

**METRIC CONVERSION FACTOR: Cv / 1.16 =kv**

# TABLE 8
## WATER CAPACITIES - GPM
## S.G. = 1.0 T = 60°F $F_L$ = 0.95
Composition Diaphragm Only

| P2 Outlet Pressure | | P1 Inlet Pressure psig (Barg) | | 3/8" (DN10) Body Size DROOP | | | 1/2" (DN15) Body Size DROOP | | | 3/4" (DN20) Body Size DROOP | | | 1" (DN25) Body Size DROOP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| psig | (Barg) | psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% |
| 5 | (.34) | 25 | (1.7) | 0.7 | 1.4 | 2.1 | 0.7 | 1.4 | 2.1 | 1.5 | 3.0 | 4.5 | 1.5 | 3.0 | 4.5 |
| | | 50 | (3.4) | 1.1 | 2.1 | 3.2 | 1.1 | 2.1 | 3.2 | 2.3 | 4.5 | 6.8 | 2.3 | 4.5 | 6.8 |
| | | 75 | (5.2) | 1.3 | 2.6 | 3.9 | 1.3 | 2.6 | 3.9 | 2.8 | 5.6 | 8.5 | 2.8 | 5.6 | 8.5 |
| | | 100 | (6.9) | 1.6 | 3.0 | 4.6 | 1.6 | 3.0 | 4.6 | 3.3 | 6.5 | 9.8 | 3.3 | 6.5 | 9.8 |
| | | 125 | (8.6) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 10 | (.69) | 25 | (1.7) | 1.2 | 2.4 | 3.6 | 1.2 | 2.4 | 3.6 | 2.6 | 5.2 | 7.8 | 2.6 | 5.2 | 7.8 |
| | | 50 | (3.4) | 2.0 | 4.0 | 5.9 | 2.0 | 4.0 | 5.9 | 4.2 | 8.5 | 12.8 | 4.2 | 8.5 | 12.8 |
| | | 75 | (5.2) | 2.5 | 5.1 | 7.6 | 2.5 | 5.1 | 7.6 | 5.4 | 10.8 | 16.3 | 5.4 | 10.8 | 16.3 |
| | | 100 | (6.9) | 2.9 | 6.0 | 8.9 | 2.9 | 6.0 | 8.9 | 6.4 | 12.7 | 19.2 | 6.4 | 12.7 | 19.2 |
| | | 125 | (8.6) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 15 | (1.0) | 25 | (1.7) | 1.5 | 3.0 | 4.5 | 1.5 | 3.0 | 4.5 | 3.2 | 6.4 | 9.6 | 3.2 | 6.4 | 9.6 |
| | | 50 | (3.4) | 2.8 | 5.6 | 8.3 | 2.8 | 5.6 | 8.3 | 6.0 | 12.0 | 17.9 | 6.0 | 12.0 | 17.9 |
| | | 75 | (5.2) | 3.6 | 7.3 | 10.9 | 3.6 | 7.3 | 10.9 | 7.8 | 15.6 | 23.5 | 7.8 | 15.6 | 23.5 |
| | | 100 | (6.9) | 4.3 | 8.7 | 13.0 | 4.3 | 8.7 | 13.0 | 9.3 | 18.6 | 27.9 | 9.3 | 18.6 | 27.9 |
| | | 125 | (8.6) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 25 | (1.7) | 50 | (3.4) | 2.0 | 4.1 | 6.1 | 2.0 | 4.1 | 6.1 | 4.5 | 9.0 | 13.4 | 4.5 | 9.0 | 13.4 |
| | | 75 | (5.2) | 2.8 | 5.7 | 8.6 | 2.8 | 5.7 | 8.6 | 6.3 | 12.7 | 19.0 | 6.3 | 12.7 | 19.0 |
| | | 100 | (6.9) | 3.5 | 7.0 | 10.5 | 3.5 | 7.0 | 10.5 | 7.7 | 15.5 | 23.2 | 7.7 | 15.5 | 23.2 |
| | | 125 | (8.6) | 4.0 | 8.1 | 12.1 | 4.0 | 8.1 | 12.1 | 8.9 | 17.9 | 26.8 | 8.9 | 17.9 | 26.8 |
| | | 150 | (10.3) | 4.5 | 9.1 | 13.5 | 4.5 | 9.1 | 13.5 | 10.0 | 20.0 | 30.0 | 10.0 | 20.0 | 30.0 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 35 | (2.4) | 50 | (3.4) | 2.2 | 4.4 | 6.5 | 2.2 | 4.4 | 6.5 | 4.8 | 9.7 | 13.9 | 4.8 | 9.7 | 13.9 |
| | | 75 | (5.2) | 3.5 | 7.1 | 10.7 | 3.5 | 7.1 | 10.7 | 7.9 | 15.9 | 22.8 | 7.9 | 15.9 | 22.8 |
| | | 100 | (6.9) | 4.5 | 9.1 | 13.6 | 4.5 | 9.1 | 13.6 | 10.1 | 20.2 | 29.0 | 10.1 | 20.2 | 29.0 |
| | | 125 | (8.6) | 5.3 | 10.7 | 16.0 | 5.3 | 10.7 | 16.0 | 11.9 | 23.8 | 34.2 | 11.9 | 23.8 | 34.2 |
| | | 150 | (10.3) | 6.0 | 12.1 | 18.1 | 6.0 | 12.1 | 18.1 | 13.4 | 26.9 | 38.6 | 13.4 | 26.9 | 38.6 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 50 | (3.4) | 75 | (5.2) | 1.8 | 3.6 | 5.4 | 1.8 | 3.6 | 5.4 | 5.8 | 11.6 | 18.0 | 5.8 | 11.6 | 18.0 |
| | | 100 | (6.9) | 2.5 | 5.0 | 7.6 | 2.5 | 5.0 | 7.6 | 8.1 | 16.3 | 25.5 | 8.1 | 16.3 | 25.5 |
| | | 125 | (8.6) | 3.1 | 6.1 | 9.3 | 3.1 | 6.1 | 9.3 | 10.0 | 20.0 | 31.2 | 10.0 | 20.0 | 31.2 |
| | | 150 | (10.3) | 3.6 | 7.1 | 10.7 | 3.6 | 7.1 | 10.7 | 11.5 | 23.1 | 36.0 | 11.5 | 23.1 | 36.0 |
| | | 175 | (12.1) | 4.0 | 7.9 | 12.0 | 4.0 | 7.9 | 12.0 | 12.9 | 25.8 | 40.2 | 12.9 | 25.8 | 40.2 |
| | | 200 | (13.8) | 4.4 | 8.7 | 13.1 | 4.4 | 8.7 | 13.1 | 14.1 | 28.3 | 44.1 | 14.1 | 28.3 | 44.1 |
| | | 250 | (17.2) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 75 | (5.2) | 100 | (6.9) | 2.7 | 5.4 | 8.1 | 2.7 | 5.4 | 8.1 | 8.7 | 16.0 | 18.0 | 8.7 | 16.0 | 18.0 |
| | | 125 | (8.6) | 3.8 | 7.6 | 11.4 | 3.8 | 7.6 | 11.4 | 12.2 | 22.6 | 25.5 | 12.2 | 22.6 | 25.5 |
| | | 150 | (10.3) | 4.7 | 9.3 | 13.9 | 4.7 | 9.3 | 13.9 | 15.0 | 27.7 | 31.2 | 15.0 | 27.7 | 31.2 |
| | | 175 | (12.1) | 5.4 | 10.7 | 16.1 | 5.4 | 10.7 | 16.1 | 17.3 | 32.0 | 36.0 | 17.3 | 32.0 | 36.0 |
| | | 200 | (13.8) | 6.0 | 12.0 | 18.0 | 6.0 | 12.0 | 18.0 | 19.3 | 35.8 | 40.2 | 19.3 | 35.8 | 40.2 |
| | | 250 | (17.2) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 100 | (6.9) | 125 | (8.6) | 1.8 | 3.6 | 5.3 | 1.8 | 3.6 | 5.3 | 5.2 | 10.3 | 18.0 | 5.2 | 10.3 | 18.0 |
| | | 150 | (10.3) | 2.5 | 5.0 | 7.5 | 2.5 | 5.0 | 7.5 | 7.3 | 14.6 | 25.5 | 7.3 | 14.6 | 25.5 |
| | | 175 | (12.1) | 3.0 | 6.1 | 9.2 | 3.0 | 6.1 | 9.2 | 8.9 | 17.8 | 31.2 | 8.9 | 17.8 | 31.2 |
| | | 200 | (13.8) | 3.5 | 7.1 | 10.6 | 3.5 | 7.1 | 10.6 | 10.3 | 20.6 | 36.0 | 10.3 | 20.6 | 36.0 |
| | | 250 | (17.2) | 4.3 | 8.7 | 13.0 | 4.3 | 8.7 | 13.0 | 12.6 | 25.2 | 44.1 | 12.6 | 25.2 | 44.1 |
| | | 300 | (20.7) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 150 | (10.3) | 175 | (12.1) | 2.7 | 5.3 | 8.0 | 2.7 | 5.3 | 8.0 | 7.7 | 15.5 | 18.0 | 7.7 | 15.5 | 18.0 |
| | | 200 | (13.8) | 3.7 | 7.5 | 11.2 | 3.7 | 7.5 | 11.2 | 10.9 | 21.8 | 25.5 | 10.9 | 21.8 | 25.5 |
| | | 250 | (17.2) | 5.3 | 10.6 | 15.9 | 5.3 | 10.6 | 15.9 | 15.4 | 30.9 | 36.0 | 15.4 | 30.9 | 36.0 |
| | | 300 | (20.7) | 6.5 | 13.0 | 19.5 | 6.5 | 13.0 | 19.5 | 18.9 | 37.8 | 44.1 | 18.9 | 37.8 | 44.1 |
| | | 350 | (24.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 175 | (12.1) | 200 | (13.8) | 2.7 | 5.3 | 8.0 | 2.7 | 5.3 | 8.0 | 6.9 | 13.7 | 18.0 | 6.9 | 13.7 | 18.0 |
| | | 250 | (17.2) | 4.6 | 9.2 | 13.8 | 4.6 | 9.2 | 13.8 | 11.9 | 23.7 | 31.2 | 11.9 | 23.7 | 31.2 |
| | | 300 | (20.7) | 5.9 | 11.9 | 17.8 | 5.9 | 11.9 | 17.8 | 15.3 | 30.6 | 40.2 | 15.3 | 30.6 | 40.2 |
| | | 350 | (24.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 200 | (13.8) | 250 | (17.2) | 4.3 | 8.6 | 12.7 | 4.3 | 8.6 | 12.7 | 11.0 | 22.1 | 25.5 | 11.0 | 22.1 | 25.5 |
| | | 300 | (20.7) | 6.1 | 12.1 | 18.0 | 6.1 | 12.1 | 18.0 | 15.6 | 31.3 | 36.0 | 15.6 | 31.3 | 36.0 |
| | | 350 | (24.1) | 7.5 | 14.8 | 22.0 | 7.5 | 14.8 | 22.0 | 19.1 | 38.3 | 44.1 | 19.1 | 38.3 | 44.1 |
| | | 400 | (27.6) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 225 | (15.5) | 250 | (17.2) | 3.4 | 6.9 | 9.0 | 3.4 | 6.9 | 9.0 | 8.8 | 17.5 | 18.0 | 8.8 | 17.5 | 18.0 |
| | | 300 | (20.7) | 5.9 | 11.9 | 15.6 | 5.9 | 11.9 | 15.6 | 15.2 | 30.3 | 31.2 | 15.2 | 30.3 | 31.2 |
| | | 350 | (24.1) | 7.6 | 15.3 | 20.1 | 7.6 | 15.3 | 20.1 | 19.7 | 39.1 | 40.2 | 19.7 | 39.1 | 40.2 |
| | | 400 | (27.6) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 250 | (17.2) | 300 | (20.7) | 5.4 | 10.7 | 12.7 | 5.4 | 10.7 | 12.7 | 13.8 | 25.5 | 25.5 | 13.8 | 25.5 | 25.5 |
| | | 350 | (24.1) | 7.6 | 15.2 | 18.0 | 7.6 | 15.2 | 18.0 | 19.5 | 36.0 | 36.0 | 19.5 | 36.0 | 36.0 |
| | | 400 | (27.6) | 9.3 | 18.6 | 22.0 | 9.3 | 18.6 | 22.0 | 23.9 | 44.1 | 44.1 | 23.9 | 44.1 | 44.1 |

Where "SHADED" the flow has reached or exceeded the velocities to the right based on Schedule 40 pipe.

Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.

**Metric Conversion Factor: GPM X 3.785 = LPM**

| SIZE | | LIMIT VEL |
|---|---|---|
| in | (DN) | |
| 3/8" | (10) | 12 - 5 fps |
| 1/2" | (15) | 15 fps |
| 3/4" | (20) | 17.5 fps |
| 1" | (25) | 20 fps |

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# TABLE 9
## AIR CAPACITY - SCFH
## S.G. = 1.0 T - 60°F $F_L$ - 0.95
Composition Diaphragm Only

| P2 Outlet Pressure psig (Barg) | | P1 Inlet Pressure psig (Barg) | | 3/8" (DN10) Body Size DROOP | | | 1/2" (DN15) Body Size DROOP | | | 3/4" (DN20) Body Size DROOP | | | 1" (DN25) Body Size DROOP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| psig | (Barg) | psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% |
| 5 | (.34) | 25 | (1.7) | 200 | 400 | 600 | 200 | 400 | 600 | 400 | 800 | 1300 | 400 | 800 | 1300 |
| | | 50 | (3.4) | 300 | 600 | 1000 | 300 | 600 | 1000 | 700 | 1400 | 2100 | 700 | 1400 | 2100 |
| | | 75 | (5.2) | 500 | 900 | 1300 | 500 | 900 | 1300 | 1000 | 1900 | 2900 | 1000 | 1900 | 2900 |
| | | 100 | (6.9) | 600 | 1100 | 1700 | 600 | 1100 | 1700 | 1200 | 2400 | 3700 | 1200 | 2400 | 3700 |
| | | 125 | (8.6) | 700 | 1400 | 2100 | 700 | 1400 | 2100 | 1500 | 3000 | 4500 | 1500 | 3000 | 4500 |
| | | 150 | (10.3) | 800 | 1600 | 2500 | 800 | 1600 | 2500 | 1800 | 3500 | 5300 | 1800 | 3500 | 5300 |
| | | 175 | (12.1) | 1000 | 1900 | 2800 | 1000 | 1900 | 2800 | 2100 | 4100 | 6100 | 2100 | 4100 | 6100 |
| | | 200 | (13.8) | 1100 | 2100 | 3200 | 1100 | 2100 | 3200 | 2300 | 4600 | 6900 | 2300 | 4600 | 6900 |
| | | 250 | (17.2) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 10 | (.69) | 25 | (1.7) | 400 | 800 | 1200 | 400 | 800 | 1200 | 800 | 1700 | 2500 | 800 | 1700 | 2500 |
| | | 50 | (3.4) | 600 | 1300 | 1900 | 600 | 1300 | 1900 | 1400 | 2800 | 4200 | 1400 | 2800 | 4200 |
| | | 75 | (5.2) | 900 | 1800 | 2700 | 900 | 1800 | 2700 | 1900 | 3800 | 5800 | 1900 | 3800 | 5800 |
| | | 100 | (6.9) | 1100 | 2300 | 3400 | 1100 | 2300 | 3400 | 2400 | 4900 | 7400 | 2400 | 4900 | 7400 |
| | | 125 | (8.6) | 1400 | 2800 | 4200 | 1400 | 2800 | 4200 | 3000 | 6000 | 9000 | 3000 | 6000 | 9000 |
| | | 150 | (10.3) | 1600 | 3300 | 4900 | 1600 | 3300 | 4900 | 3500 | 7000 | 10600 | 3500 | 7000 | 10600 |
| | | 175 | (12.1) | 1900 | 3800 | 5700 | 1900 | 3800 | 5700 | 4100 | 8100 | 12200 | 4100 | 8100 | 12200 |
| | | 200 | (13.8) | 2100 | 4300 | 6400 | 2100 | 4300 | 6400 | 4600 | 9200 | 13800 | 4600 | 9200 | 13800 |
| | | 250 | (17.2) | 2600 | 5300 | 7900 | 2600 | 5300 | 7900 | 5700 | 11300 | 17100 | 5700 | 11300 | 17100 |
| 15 | (1.0) | 25 | (1.7) | 600 | 1100 | 1700 | 600 | 1100 | 1700 | 1200 | 2400 | 3600 | 1200 | 2400 | 3600 |
| | | 50 | (3.4) | 1000 | 1900 | 2900 | 1000 | 1900 | 2900 | 2100 | 4200 | 6200 | 2100 | 4200 | 6200 |
| | | 75 | (5.2) | 1300 | 2700 | 4000 | 1300 | 2700 | 4000 | 2900 | 5800 | 8600 | 2900 | 5800 | 8600 |
| | | 100 | (6.9) | 1700 | 3400 | 5100 | 1700 | 3400 | 5100 | 3700 | 7400 | 11100 | 3700 | 7400 | 11100 |
| | | 125 | (8.6) | 2100 | 4200 | 6300 | 2100 | 4200 | 6300 | 4500 | 9000 | 13500 | 4500 | 9000 | 13500 |
| | | 150 | (10.3) | 2500 | 4900 | 7400 | 2500 | 4900 | 7400 | 5300 | 10600 | 15900 | 5300 | 10600 | 15900 |
| | | 175 | (12.1) | 2800 | 5700 | 8500 | 2800 | 5700 | 8500 | 6100 | 12200 | 18300 | 6100 | 12200 | 18300 |
| | | 200 | (13.8) | 3200 | 6400 | 9700 | 3200 | 6400 | 9700 | 6900 | 13800 | 20800 | 6900 | 13800 | 20800 |
| | | 250 | (17.2) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 20 | (1.7) | 50 | (3.4) | 800 | 1600 | 2400 | 800 | 1600 | 2400 | 1800 | 3600 | 5400 | 1800 | 3600 | 5400 |
| | | 75 | (5.2) | 1100 | 2300 | 3500 | 1100 | 2300 | 3500 | 2500 | 5100 | 7700 | 2500 | 5100 | 7700 |
| | | 100 | (6.9) | 1500 | 3000 | 4400 | 1500 | 3000 | 4400 | 3300 | 6500 | 9800 | 3300 | 6500 | 9800 |
| | | 125 | (8.6) | 1800 | 3600 | 5400 | 1800 | 3600 | 5400 | 4000 | 8000 | 11900 | 4000 | 8000 | 11900 |
| | | 150 | (10.3) | 2100 | 4300 | 6400 | 2100 | 4300 | 6400 | 4700 | 9400 | 14100 | 4700 | 9400 | 14100 |
| | | 175 | (12.1) | 2400 | 4900 | 7300 | 2400 | 4900 | 7300 | 5400 | 10800 | 16200 | 5400 | 10800 | 16200 |
| | | 200 | (13.8) | 2700 | 5500 | 8300 | 2700 | 5500 | 8300 | 6100 | 12300 | 18400 | 6100 | 12300 | 18400 |
| | | 250 | (17.2) | 3400 | 6800 | 10200 | 3400 | 6800 | 10200 | 7500 | 15100 | 22600 | 7500 | 15100 | 22600 |
| | | 300 | (20.7) | 4000 | 8100 | 12200 | 4000 | 8100 | 12200 | 8900 | 18000 | 26900 | 8900 | 18000 | 26900 |
| | | 350 | (24.1) | 4700 | 9400 | 14100 | 4700 | 9400 | 14100 | 10400 | 20800 | 31200 | 10400 | 20800 | 31200 |
| | | 400 | (27.6) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 35 | (2.4) | 50 | (3.4) | 1000 | 2000 | 3000 | 1000 | 2000 | 3000 | 2200 | 4500 | 6400 | 2200 | 4500 | 6400 |
| | | 75 | (5.2) | 1600 | 3200 | 4800 | 1600 | 3200 | 4800 | 3500 | 7100 | 10200 | 3500 | 7100 | 10200 |
| | | 100 | (6.9) | 2000 | 4100 | 6200 | 2000 | 4100 | 6200 | 4600 | 9200 | 13100 | 4600 | 9200 | 13100 |
| | | 125 | (8.6) | 2500 | 5000 | 7500 | 2500 | 5000 | 7500 | 5600 | 11200 | 16000 | 5600 | 11200 | 16000 |
| | | 150 | (10.3) | 2900 | 5900 | 8900 | 2900 | 5900 | 8900 | 6600 | 13200 | 18900 | 6600 | 13200 | 18900 |
| | | 175 | (12.1) | 3400 | 6800 | 10200 | 3400 | 6800 | 10200 | 7600 | 15200 | 21800 | 7600 | 15200 | 21800 |
| | | 200 | (13.8) | 3800 | 7700 | 11600 | 3800 | 7700 | 11600 | 8600 | 17200 | 24700 | 8600 | 17200 | 24700 |
| | | 250 | (17.2) | 4700 | 9500 | 14300 | 4700 | 9500 | 14300 | 10600 | 21200 | 30400 | 10600 | 21200 | 30400 |
| | | 300 | (20.7) | 5600 | 11400 | 17000 | 5600 | 11400 | 17000 | 12600 | 25200 | 36200 | 12600 | 25200 | 36200 |
| | | 350 | (24.1) | 6500 | 13200 | SONIC | 6500 | 13200 | 19700 | 14600 | 29200 | 41900 | 14600 | 29200 | 41900 |
| | | 400 | (27.6) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 50 | (3.4) | 75 | (5.2) | 900 | 1800 | 2700 | 900 | 1800 | 2700 | 2900 | 5900 | 9200 | 2900 | 5900 | 9200 |
| | | 100 | (6.9) | 1300 | 2500 | 3800 | 1300 | 2500 | 3800 | 4100 | 8300 | 12900 | 4100 | 8300 | 12900 |
| | | 125 | (8.6) | 1600 | 3200 | 4800 | 1600 | 3200 | 4800 | 5100 | 10300 | 16000 | 5100 | 10300 | 16000 |
| | | 150 | (10.3) | 1900 | 3700 | 5600 | 1900 | 3700 | 5600 | 6000 | 12100 | 18900 | 6000 | 12100 | 18900 |
| | | 175 | (12.1) | 2200 | 4300 | 6500 | 2200 | 4300 | 6500 | 7000 | 14000 | 21800 | 7000 | 14000 | 21800 |
| | | 200 | (13.8) | 2500 | 4900 | 7300 | 2500 | 4900 | 7300 | 7900 | 15800 | 24700 | 7900 | 15800 | 24700 |
| | | 250 | (17.2) | 3000 | 6000 | 9000 | 3000 | 6000 | 9000 | 9700 | 19500 | 30400 | 9700 | 19500 | 30400 |
| | | 300 | (20.7) | 3600 | 7100 | 10800 | 3600 | 7100 | 10800 | 11600 | 23200 | 36200 | 11600 | 23200 | 36200 |
| | | 350 | (24.1) | 4200 | 8300 | 12500 | 4200 | 8300 | 12500 | 13400 | 26900 | 41900 | 13400 | 26900 | 41900 |
| | | 400 | (27.6) | 4800 | 9400 | 14200 | 4800 | 9400 | 14200 | 15200 | 30600 | 47700 | 15200 | 30600 | 47700 |

**NOTE:** Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.
Where "SONIC" is indicated, outlet velocity with Schedule 40 pipe exceeds sonic velocity of 1118 fps. Additional flow cannot be obtained, and pipeline velocity is in excess of customary pipe velocity design limits. Flow will be approximately the last indicated value in the column above "SONIC".

Recommend use of Opt-4 Stabilizer. Velocity exceeds M = 0.65; recommend use of Opt-4.

**Metric Conversion Factors: SCFH / 35.31 = $Sm^3/Hr$; SCFH / 37.32 = $N\text{-}m^3/Hr$**

## TABLE 9 (cont.)
## AIR CAPACITY - SCFH
## S.G. = 1.0 T - 60°F $F_L$ - 0.95
Composition Diaphragm Only

| P2 Outlet Pressure | | P1 Inlet Pressure | | 3/8" (DN10) Body Size DROOP | | | 1/2" (DN15) Body Size DROOP | | | 3/4" (DN20) Body Size DROOP | | | 1" (DN25) Body Size DROOP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| psig | (Barg) | psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% |
| 75 | (5.2) | 100 | (6.9) | 1600 | 3200 | 4800 | 1600 | 3200 | 4800 | 5200 | 9500 | 10700 | 5200 | 9500 | 10700 |
| | | 125 | (8.6) | 2300 | 4500 | 6700 | 2300 | 4500 | 6700 | 7200 | 13400 | 15000 | 7200 | 13400 | 15000 |
| | | 150 | (10.3) | 2800 | 5500 | 8300 | 2800 | 5500 | 8300 | 8900 | 16500 | 18500 | 8900 | 16500 | 18500 |
| | | 175 | (12.1) | 3300 | 6400 | 9700 | 3300 | 6400 | 9700 | 10400 | 19300 | 21700 | 10400 | 19300 | 21700 |
| | | 200 | (13.8) | 3700 | 7300 | 11000 | 3700 | 7300 | 11000 | 11800 | 21900 | 24700 | 11800 | 21900 | 24700 |
| | | 250 | (17.2) | 4600 | 9000 | 13600 | 4600 | 9000 | 13600 | 14600 | 27000 | 30400 | 14600 | 27000 | 30400 |
| | | 300 | (20.7) | 5400 | 10800 | 16200 | 5400 | 10800 | 16200 | 17400 | 32200 | 36200 | 17400 | 32200 | 36200 |
| | | 350 | (24.1) | 6300 | 12500 | 18800 | 6300 | 12500 | 18800 | 20100 | 37300 | 41900 | 20100 | 37300 | 41900 |
| | | 400 | (27.6) | 7200 | 14200 | 21300 | 7200 | 14200 | 21300 | 22900 | 42400 | 47700 | 22900 | 42400 | 47700 |
| 100 | (6.9) | 125 | (8.6) | 1200 | 2400 | 3500 | 1200 | 2400 | 3500 | 3400 | 6900 | 12000 | 3400 | 6900 | 12000 |
| | | 150 | (10.3) | 1600 | 3300 | 5000 | 1600 | 3300 | 5000 | 4800 | 9700 | 16900 | 4800 | 9700 | 16900 |
| | | 175 | (12.1) | 2000 | 4100 | 6100 | 2000 | 4100 | 6100 | 5900 | 11900 | 20800 | 5900 | 11900 | 20800 |
| | | 200 | (13.8) | 2400 | 4800 | 7100 | 2400 | 4800 | 7100 | 6900 | 13800 | 24200 | 6900 | 13800 | 24200 |
| | | 250 | (17.2) | 3000 | 6000 | 8900 | 3000 | 6000 | 8900 | 8700 | 17400 | 30400 | 8700 | 17400 | 30400 |
| | | 300 | (20.7) | 3500 | 7100 | 10700 | 3500 | 7100 | 10700 | 10400 | 20700 | 36200 | 10400 | 20700 | 36200 |
| | | 350 | (24.1) | 4100 | 8300 | 12300 | 4100 | 8300 | 12300 | 12000 | 24000 | 41900 | 12000 | 24000 | 41900 |
| | | 400 | (27.6) | 4600 | 9400 | 14000 | 4600 | 9400 | 14000 | 13600 | 27300 | 47700 | 13600 | 27300 | 47700 |
| 150 | (10.3) | 175 | (12.1) | 2100 | 4200 | 6300 | 2100 | 4200 | 6300 | 6100 | 12300 | 14300 | 6100 | 12300 | 14300 |
| | | 200 | (13.8) | 3000 | 5900 | 8900 | 3000 | 5900 | 8900 | 8600 | 17300 | 20100 | 8600 | 17300 | 20100 |
| | | 250 | (17.2) | 4200 | 8400 | 12600 | 4200 | 8400 | 12600 | 12200 | 24500 | 28600 | 12200 | 24500 | 28600 |
| | | 300 | (20.7) | 5200 | 10400 | 15700 | 5200 | 10400 | 15700 | 15200 | 30500 | 35500 | 15200 | 30500 | 35500 |
| | | 350 | (24.1) | 6100 | 12300 | 18400 | 6100 | 12300 | 18400 | 17900 | 35800 | 41700 | 17900 | 35800 | 41700 |
| | | 400 | (27.6) | 7000 | 14000 | 21100 | 7000 | 14000 | 21100 | 20400 | 40900 | 47700 | 20400 | 40900 | 47700 |
| 175 | (12.1) | 200 | (13.8) | 2200 | 4500 | 6700 | 2200 | 4500 | 6700 | 5800 | 11600 | 15300 | 5800 | 11600 | 15300 |
| | | 250 | (17.2) | 3900 | 7800 | 11600 | 3900 | 7800 | 11600 | 10000 | 20100 | 26400 | 10000 | 20100 | 26400 |
| | | 300 | (20.7) | 5000 | 10100 | 15100 | 5000 | 10100 | 15100 | 13000 | 26100 | 34300 | 13000 | 26100 | 34300 |
| | | 350 | (24.1) | 6100 | 12100 | 18200 | 6100 | 12100 | 18200 | 15600 | 31300 | 41100 | 15600 | 31300 | 41100 |
| | | 400 | (27.6) | 7000 | 14000 | 20900 | 7000 | 14000 | 20900 | 18000 | 36100 | 47400 | 18000 | 36100 | 47400 |
| 200 | (13.8) | 250 | (17.2) | 3900 | 7700 | 11400 | 3900 | 7700 | 11400 | 9900 | 19900 | 22800 | 9900 | 19900 | 22800 |
| | | 300 | (20.7) | 5500 | 10900 | 16200 | 5500 | 10900 | 16200 | 14000 | 28100 | 32400 | 14000 | 28100 | 32400 |
| | | 350 | (24.1) | 6800 | 13400 | 20000 | 6800 | 13400 | 20000 | 17300 | 34800 | 40000 | 17300 | 34800 | 40000 |
| | | 400 | (27.6) | 7900 | 15700 | 23400 | 7900 | 15700 | 23400 | 20300 | 40700 | 46800 | 20300 | 40700 | 46800 |
| 225 | (15.5) | 250 | (17.2) | 3200 | 6500 | 8500 | 3200 | 6500 | 8500 | 8400 | 16600 | 17100 | 8400 | 16600 | 17100 |
| | | 300 | (20.7) | 5600 | 11200 | 14800 | 5600 | 11200 | 14800 | 14400 | 28700 | 29500 | 14400 | 28700 | 29500 |
| | | 350 | (24.1) | 7200 | 14600 | 19100 | 7200 | 14600 | 19100 | 18700 | 37200 | 38200 | 18700 | 37200 | 38200 |
| | | 400 | (27.6) | 8600 | 17400 | 22800 | 8600 | 17400 | 22800 | 22300 | 44400 | 45700 | 22300 | 44400 | 45700 |
| 250 (17.2) | | 300 | (20.7) | 5300 | 10700 | 12600 | 5300 | 10700 | 12600 | 13700 | 25300 | 25300 | 13700 | 25300 | 25300 |
| | | 350 | (24.1) | 7600 | 15100 | 17900 | 7600 | 15100 | 17900 | 19400 | 35800 | 35800 | 19400 | 35800 | 35800 |
| | | 400 | (27.6) | 9300 | 18600 | 22000 | 9300 | 18600 | 22000 | 23900 | 44100 | 44100 | 23900 | 44100 | 44100 |

**NOTE:** Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.
Where "SONIC" is indicated, outlet velocity with Schedule 40 pipe exceeds sonic velocity of 1118 fps. Additional flow cannot be obtained, and pipeline velocity is in excess of customary pipe velocity design limits. Flow will be approximately the last indicated value in the column above "SONIC".

Recommend use of Opt-4 Stabilizer.

Velocity exceeds M = 0.65; recommend use of Opt-4.

**Metric Conversion Factors: SCFH / 35.31 = $Sm^3/Hr$; SCFH / 37.32 = $N\text{-}m^3/Hr$**

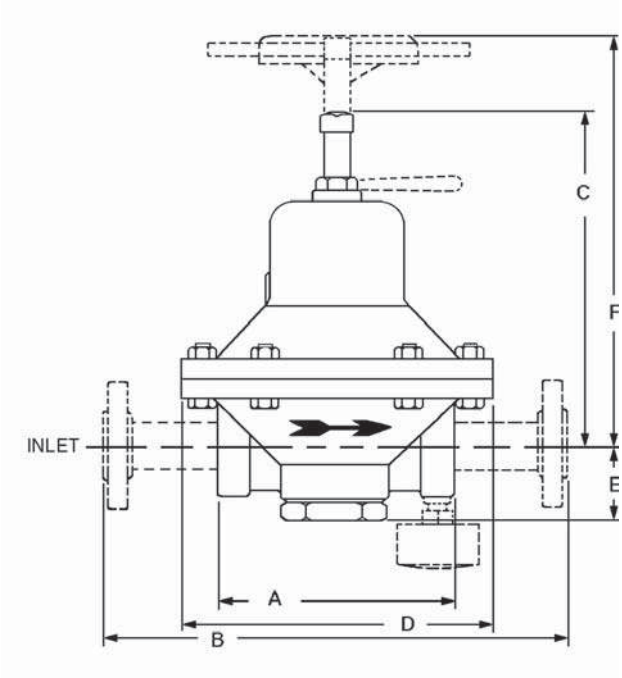
# TABLE 10
## STEAM - LBS/HR
## S.G. = Actual T = Saturated $F_L$ = 0.95
Metal Diaphragm Only

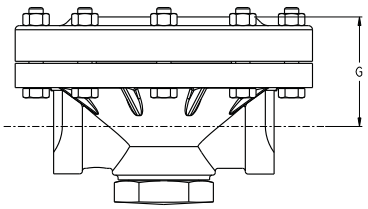
| P2 Outlet Pressure | | P1 Inlet Pressure psig (Barg) | | 3/8" (DN10) Body Size DROOP | | | 1/2" (DN15) Body Size DROOP | | | 3/4" (DN20) Body Size DROOP | | | 1" (DN25) Body Size DROOP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| psig | (Barg) | psig | (Barg) | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% | 10% | 20% | 30% |
| 2 | (.14) | 25 | (1.7) | 3 | 6 | 10 | 3 | 6 | 10 | 5 | 10 | 14 | 5 | 10 | 14 |
| | | 50 | (3.4) | 5 | 10 | 16 | 5 | 10 | 16 | 8 | 16 | 24 | 8 | 16 | 24 |
| | | 75 | (5.2) | 6 | 14 | 22 | 6 | 14 | 22 | 11 | 22 | 33 | 11 | 22 | 33 |
| | | 100 | (6.9) | 8 | 18 | 28 | 8 | 18 | 28 | 14 | 28 | 42 | 14 | 28 | 42 |
| | | 125 | (8.6) | 10 | 22 | 34 | 10 | 22 | 34 | 17 | 34 | 51 | 17 | 34 | 51 |
| | | 150 | (10.3) | 11 | 26 | 40 | 11 | 26 | 40 | 20 | 40 | 60 | 20 | 40 | 60 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 5 | (.34) | 25 | (1.7) | 7 | 15 | 23 | 7 | 15 | 23 | 12 | 23 | 35 | 12 | 23 | 35 |
| | | 50 | (3.4) | 12 | 24 | 38 | 12 | 24 | 38 | 20 | 39 | 59 | 20 | 39 | 59 |
| | | 75 | (5.2) | 17 | 35 | 54 | 17 | 35 | 54 | 28 | 55 | 83 | 28 | 55 | 83 |
| | | 100 | (6.9) | 22 | 44 | 68 | 22 | 44 | 68 | 36 | 70 | 106 | 36 | 70 | 106 |
| | | 125 | (8.6) | 27 | 53 | 82 | 27 | 53 | 82 | 44 | 85 | 128 | 44 | 85 | 128 |
| | | 150 | (10.3) | 31 | 63 | 97 | 31 | 63 | 97 | 51 | 100 | 151 | 51 | 100 | 151 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 10 | (.69) | 25 | (1.7) | 14 | 28 | 42 | 14 | 28 | 42 | 22 | 44 | 65 | 22 | 44 | 65 |
| | | 50 | (3.4) | 24 | 49 | 74 | 24 | 49 | 74 | 38 | 77 | 115 | 38 | 77 | 115 |
| | | 75 | (5.2) | 34 | 69 | 103 | 34 | 69 | 103 | 54 | 108 | 161 | 54 | 108 | 161 |
| | | 100 | (6.9) | 44 | 90 | 134 | 44 | 90 | 134 | 70 | 140 | 210 | 70 | 140 | 210 |
| | | 125 | (8.6) | 53 | 109 | 162 | 53 | 109 | 162 | 85 | 170 | 254 | 85 | 170 | 254 |
| | | 150 | (10.3) | 63 | 128 | 190 | 63 | 128 | 190 | 100 | 199 | 299 | 100 | 199 | 299 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 15 | (1.0) | 25 | (1.7) | 19 | 37 | 55 | 19 | 37 | 55 | 29 | 57 | 86 | 29 | 57 | 86 |
| | | 50 | (3.4) | 37 | 72 | 109 | 37 | 72 | 109 | 57 | 113 | 171 | 57 | 113 | 171 |
| | | 75 | (5.2) | 52 | 102 | 153 | 52 | 102 | 153 | 80 | 159 | 239 | 80 | 159 | 239 |
| | | 100 | (6.9) | 67 | 133 | 200 | 67 | 133 | 200 | 105 | 208 | 312 | 105 | 208 | 312 |
| | | 125 | (8.6) | 82 | 162 | 245 | 82 | 162 | 245 | 128 | 254 | 383 | 128 | 254 | 383 |
| | | 150 | (10.3) | 97 | 190 | 287 | 97 | 190 | 287 | 151 | 299 | 449 | 151 | 299 | 449 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 25 | (1.7) | 25 | (1.7) | 28 | 57 | 85 | 28 | 57 | 85 | 44 | 88 | 132 | 44 | 88 | 132 |
| | | 50 | (3.4) | 42 | 85 | 127 | 42 | 85 | 127 | 66 | 131 | 197 | 66 | 131 | 197 |
| | | 75 | (5.2) | 54 | 110 | 164 | 54 | 110 | 164 | 85 | 169 | 254 | 85 | 169 | 254 |
| | | 100 | (6.9) | 66 | 134 | 200 | 66 | 134 | 200 | 104 | 207 | 311 | 104 | 207 | 311 |
| | | 125 | (8.6) | 80 | 162 | 242 | 80 | 162 | 242 | 125 | 250 | 375 | 125 | 250 | 375 |
| | | 150 | (10.3) | 91 | 186 | 278 | 91 | 186 | 278 | 144 | 287 | 431 | 144 | 287 | 431 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 35 | (2.4) | 40 | (2.8) | 57 | 113 | 170 | 57 | 113 | 170 | 89 | 176 | 264 | 89 | 176 | 264 |
| | | 65 | (4.5) | 76 | 150 | 226 | 76 | 150 | 226 | 118 | 233 | 351 | 118 | 233 | 351 |
| | | 90 | (6.2) | 93 | 184 | 277 | 93 | 184 | 277 | 144 | 287 | 431 | 144 | 287 | 431 |
| | | 115 | (7.9) | 110 | 216 | 326 | 110 | 216 | 326 | 170 | 337 | 507 | 170 | 337 | 507 |
| | | 140 | (9.7) | 129 | 255 | 383 | 129 | 255 | 383 | 200 | 396 | 596 | 200 | 396 | 596 |
| | | 165 | (11.4) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 50 | (3.4) | 75 | (5.2) | 59 | 119 | 176 | 59 | 119 | 176 | 112 | 224 | 338 | 112 | 224 | 338 |
| | | 100 | (6.9) | 71 | 141 | 209 | 71 | 141 | 209 | 133 | 267 | 402 | 133 | 267 | 402 |
| | | 125 | (8.6) | 82 | 163 | 242 | 82 | 163 | 242 | 154 | 308 | 465 | 154 | 308 | 465 |
| | | 150 | (10.3) | 92 | 185 | 274 | 92 | 185 | 274 | 174 | 348 | 526 | 174 | 348 | 526 |
| | | 200 | (13.8) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 75 | (5.2) | 100 | (6.9) | 120 | 236 | 356 | 120 | 236 | 356 | 227 | 454 | 681 | 227 | 454 | 681 |
| | | 125 | (8.6) | 137 | 271 | 408 | 137 | 271 | 408 | 260 | 520 | 780 | 260 | 520 | 780 |
| | | 175 | (12.1) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 100 (6.9) | | 150 | (10.3) | 120 | 241 | 357 | 120 | 241 | 357 | 232 | 464 | 697 | 232 | 464 | 697 |
| | | 200 | (13.8) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |
| 135 (9.3) | | 165 | (11.4) | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP | HI DP |

**NOTE:** Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.
Outlet velocity exceeds M = 0.35.

**Metric Conversion Factor: LBS/HR X 0.4536 = KG/HR**

# DIMENSIONS & WEIGHTS




Opt-20

| Option No. | Size Inch | Dimensions - English (In.) | | | | | | | | | Shipping Weight lbs. [5] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B [1] | B [2] | B [3] | C | D | E [4] | F | G | |
| Std. & Opt.-20 | 3/8 | 3.88* | N/A | N/A | N/A | 6.31 | 5.31 | 1.62 | 7.66 | 2.18 | 7 |
| | 1/2 | 3.88 | 9 | 9 | 11.75 | 6.31 | 5.31 | 1.62 | 7.66 | 2.18 | 7 |
| | 3/4 | 4.94 | 11 | 11.75 | 12.81 | 7.25 | 6.50 | 1.56 | 8.59 | 2.40 | 13 |
| | 1 | 4.94 | 11 | 11.75 | 12.81 | 7.25 | 6.50 | 1.56 | 8.59 | 2.40 | 13 |
| -80 | 3/8 | 3.88* | N/A | N/A | N/A | 7.30 | 5.31 | 1.62 | 8.60 | N/A | 10 |
| | 1/2 | 3.88 | 9 | 9 | 11.75 | 7.30 | 5.31 | 1.62 | 8.60 | N/A | 10 |
| | 3/4 | 4.94 | 11 | 11.75 | 12.81 | 8.50 | 6.50 | 1.56 | 9.90 | N/A | 21 |
| | 1 | 4.94 | 11 | 11.75 | 12.81 | 8.50 | 6.50 | 1.56 | 9.90 | N/A | 21 |

*NPT Only
[1] 150# Flanged, Opt-30
[2] 300# Flanged, Opt-30
[3] Extended Nipples, Opt-32
[4] Add 1 inch for Opt-37.
[5] Weights do not include flanges.

| Option No. | Size (DN) | Dimensions - Metric (mm) | | | | | | | | | Shipping Weight kgs. [5] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B [1] | B [2] | B [3] | C | D | E [4] | F | G | |
| Std. & Opt.-20 | (10) | 98* | N/A | N/A | N/A | 160 | 135 | 41 | 194 | 55 | 3.2 |
| | (15) | 98 | 229 | 229 | 298 | 160 | 135 | 41 | 194 | 55 | 3.2 |
| | (20) | 125 | 279 | 298 | 325 | 184 | 165 | 40 | 218 | 61 | 5.9 |
| | (25) | 125 | 279 | 298 | 325 | 184 | 165 | 40 | 218 | 61 | 5.9 |
| -80 | (10) | 98* | N/A | N/A | N/A | 185 | 135 | 41 | 218 | N/A | 4.5 |
| | (15) | 98 | 229 | 229 | 298 | 185 | 135 | 41 | 218 | N/A | 4.5 |
| | (20) | 125 | 279 | 298 | 325 | 216 | 165 | 40 | 251 | N/A | 9.5 |
| | (25) | 125 | 279 | 298 | 325 | 216 | 165 | 40 | 251 | N/A | 9.5 |

*NPT Only
[1] 150# Flanged, Opt-30
[2] 300# Flanged, Opt-30
[3] Extended Nipples, Opt-32
[4] Add 25.4 mm for Opt-37
[5] Weights do not include flanges.

# PRODUCT CODE

## Cryogenic OPT-5 or -36 BRZ or SST Body Mat'l OR For LCC Body Mat'l to -50°F(-46°C)

| 2C | Table 1 | — | Table 2 | Table 3 | 7 | — | Table 4 | Table 5 | Table 6 | Table 6 | 0 | 0 | 0 | 0 | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| TABLE 1 - SIZES | | |
|---|---|---|
| Size | | CODE |
| in | (DN) | |
| 1/2" | (15) | 4 |
| 3/4" | (20) | 5 |
| 1" | (25) | 6 |

| TABLE 2 - BODY & SPRING CHAMBER MATERIALS | | |
|---|---|---|
| Body / Sp. Ch. | Option | CODE |
| BRZ/BRZ | -5 * | 3 |
| BRZ/BRZ | -5+80 * | L |
| SST/SST | -36 * | A |
| CS/CS (LCC) | ** | D |
| * Cleaned per Spec #S-1134 (Opt.-55)<br>** Minimum temperature -50° F (-46° C) | | |

| TABLE 3 - TRIM DESIGNATION NUMBERS | | | |
|---|---|---|---|
| BRZ Trim (For Brass Body) | | SST Trim (For SST & LCC Body) | |
| Desig. | CODE | Desig. | CODE |
| B0 | B0 | S1 | S1 |
| B5 | B5 | S36 | 36 |
| | | S40B * | 4B |
| | | S40C * | 4C |
| * NACE Trim use w/ CS or SST Body down to -50° F (-46° C) | | | |

| TABLE 4 - END CONNECTIONS | |
|---|---|
| Description | CODE |
| NPT - Screwed | 1 |
| -30 Opt. - 150 LB RF Flgs. * (CS/SST Bodies-1/2",3/4", & 1" Sizes) (DN15, DN20, DN25 Sizes) | 6 |
| -30 Opt.- 300 LB RF Flgs. * (CS/SST Bodies-1/2",3/4", & 1" Sizes) (DN15, DN20, DN25 Sizes) | 7 |
| * Nipples & flanges of same material as body, CS or SST bodies only. | |

| TABLE 5 - RANGE SPRINGS | | |
|---|---|---|
| SST Range Spring | | CODE |
| psig | (Barg) | |
| 2-15 | (.14-1.0) | A |
| 10-40 | (.69-2.8) | B |
| 30-80 | (2.1-5.5) | C |
| 70-150 | (4.8-10.3) | D |
| 100-250 * | (6.9-17.2) | P |
| * Opt-80 only | | |

| TABLE 6 - OPTIONS FOR -5 & -36 ONLY | | |
|---|---|---|
| Description | Option | CODE |
| No Option | --- | 0 |
| Stabilizer | -4 | 4 |
| SST Rain-proof Bug Vent (includes Opt-25) | -25S | H |
| NACE Const: CS/CS/XX Per MR0175, S40B, S40C Trims * | -40 | J |
| NACE Const: SST/SST/XX Per MR0175, S40B, S40C Trims * | -40SST | K |
| 1/8 (DN6) NPT Body Tap: for output gauge connection. | -85 | T |
| * Not Available for OPT-5 or -36 | | |

1. NUMERIC digits assigned first in "ascending" order.
2. ALPHA designations are assigned second in "alphabetical" order.
3. Left justify.
4. Add "0" to all unused squares.
5. If insufficient quantity of squares, consult factory for proper code.
6. For Special Construction Other Than Above, contact Cashco for Special Product Code

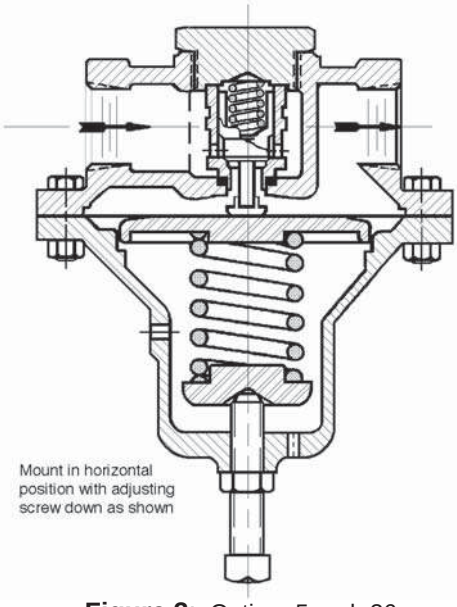



**Figure 3**: Option -5 and -36 Cryogenic Construction.

## Pharmaceutical and Food Industry - OPT-37 or -37S

| 2K | Table 1 | — | A | Table 2 | 7 | — | 1 | Table 3 | 0 | 0 | 0 | 0 | 0 | 0 | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| TABLE 1 - SIZES | | |
|---|---|---|
| Size | | CODE |
| in | (DN) | |
| 1/2" | (15) | 4 |
| 3/4" | (20) | 5 |
| 1" | (25) | 6 |

| TABLE 2 - TRIM DESIGNATION NUMBERS | | |
|---|---|---|
| STAINLESS STEEL Trim | | |
| Desig. | OPT.- | CODE |
| S1 | 37S | S1 |
| S6 * | 37 | S6 |
| * Not For Steam Service (See Opt-37S) | | |

| TABLE 3 - RANGE SPRINGS | | |
|---|---|---|
| SST Range Spring | | CODE |
| psig | (Barg) | |
| 2-15 | (.14-1.0) | A |
| 10-40 | (.69-2.8) | B |
| 30-80 | (2.1-5.5) | C |

# PRODUCT CODE

## MODEL D -20 PRESSURE LOADED

When ordering a product requiring special construction or per a special Cashco drawing, the code "X" in this position followed by a 5-digit control number override all remaining Table Codes. Otherwise, proceed with coding per following Tables.

| 2 | L | Table 1 | — | Table 2 | Table 3 | Table 4 | — | Table 5 | 0 | Table 6 | Table 6 | Table 6 | Table 6 | Table 6 | Table 6 | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**TABLE 1 - SIZES**

| Size | | CODE |
|---|---|---|
| in | (DN) | |
| 3/8" | (10) | 3 |
| 1/2" | (15) | 4 |
| 3/4" | (20) | 5 |
| 1" | (25) | 6 |

**TABLE 2 - BODY & LOADING CHAMBER MATERIALS**

| Material | CODE |
|---|---|
| CI/BR | 6 |
| CI/CS | C |
| BRZ/BRZ | 3 |
| CS/CS (WCB) | 5 |
| SST/CS | 9 |

**TABLE 3 - TRIM DESIGNATION NUMBERS**

| Brass Trim | | Stainless Steel Trim | | | |
|---|---|---|---|---|---|
| | | Body Material | | | |
| Desig. | CODE | Desig. | BR. CODE | CI CODE | CS or SST CODE |
| B2 | B2 | S2N | SN | SN | SN |
| B3 | B3 | S3 | S3 | S3 | S3 |
| B4 ^ | B4 | S4 | S4 | S4 | S4 |
| BB | BB | S4N | SD | SD | SD |
| BJ ^ | BJ | S6 | - | S6 | S6 |
| | | S7 ^ | S7 | S7 | S7 |
| | | SB | SB | SB | SB |
| | | SG | SG | SG | SG |
| | | SJ ^ | SJ | SJ | SJ |

^ Trim Designation Nos. useable for oxygen service.

**TABLE 4 - Product Classification Under European "Pressure Equipment Directive"**

| PRODUCT DESTINATION | HAZARD CATEGORY | CODE |
|---|---|---|
| Anywhere except Europe | N/A | 7 |
| European Countries * | Sound Engineering Practice (SEP) | S |

***** For products to be placed in service in Europe - Ref to Directive 97/23/EC.
Forward Completed "EU" Application Recorder prior to quotation. (Without Recorder- Processing of Purchase Order will be delayed). Contact Cashco for Assistance.

**TABLE 5 - END CONNECTIONS**

| Description | CODE |
|---|---|
| NPT - Screwed | 1 |
| -30 Opt. - 150 LB RF Flgs. ∗ (CS/SST Bodies-1/2",3/4", & 1" Sizes) (DN15, DN20, DN25 Sizes) | 6 |
| -30 Opt.- 300 LB RF Flgs. ∗ (CS/SST Bodies-1/2",3/4", & 1" Sizes) (DN15, DN20, DN25 Sizes) | 7 |
| -31 Opt.- BSPT - Screwed Tapered Pipe Thread | B |
| -31P Opt. - BSPP - Screwed Parallel Pipe Thread | P |
| -32 Opt. - SCH. 80 PE Ext. Nipples ∗ | E |

∗ Nipples & flanges of same material as body.
CS or SST bodies only.

**TABLE 6 - OPTIONS**

| Description | Option | CODE |
|---|---|---|
| No Option | --- | 0 |
| Stabilizer | -4 | 4 |
| Special Cleaning: Per Cashco Spec #S-1134. W/ properly selected mat'ls,this procedure suitable for oxygen service. BRZ body material. | -55 | M |
| Special Cleaning: Per Cashco Spec #S-1542. All body/spring chamber materials. | -56 | N |
| 1/8" (DN6) NPT Body Tap: for output gauge connection. | -85 | T |
| Epoxy Painted Per Cashco Spec #S-1547 | -95 | W |
| Epoxy Painted Per Cashco Spec #S-1687 Offshore | -95OS | Y |
| For Special Construction Other Than Above, Contact Cashco for Special Product Code | | |

1. NUMERIC digits assigned first in "ascending" order.
2. ALPHA designations are assigned second in "alphabetical" order.
3. Left justify.
4. Add "0" to all unused squares.
5. If insufficient quantity of squares, consult factory for proper code.

# MODEL D PRODUCT CODE 06/04/12

When ordering a product requiring special construction or per a special Cashco drawing, the code "X" in this position followed by a 5-digit control number override all remaining Table Codes. Otherwise, proceed with coding per following Tables.

| 2 | Table 1 | Table 2 | — | Table 3 | Table 4 | Table 5 | — | Table 6 | Table 7 | Table 8 | Table 8 | Table 8 | Table 8 | Table 8 | Table 8 | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**TABLE 1 - GASKETS * & SERVICE**

| Gaskets - Service | Options | CODE |
|---|---|---|
| Standard : Graphite/NBR - Non-Oxygen | -- | B |
| TFE - Primarily for Oxygen | -45 | D |
| * Refer to Tech Bulletin for temperature limits | | |

**TABLE 2 - SIZES**

| Size | | CODE |
|---|---|---|
| in | (DN) | |
| 3/8" | (10) | 3 |
| 1/2" | (15) | 4 |
| 3/4" | (20) | 5 |
| 1" | (25) | 6 |

**TABLE 3 - BODY & SPRING CHAMBER MATERIALS**

| Opt. | Body/ Sp. Ch. | CODE |
|---|---|---|
| Std, | CI/CI | 1 |
| | BRZ/CI | 2 |
| | BRZ/BRZ | 3 |
| | CS/CI | 4 |
| | CS/CS (WCB) | 5 |
| | SST/CI | 7 |
| | SST/CS | 9 |
| | SST/SST | A |
| -80 | BRZ/BRZ | L |

**NOTE:** See Table 1 for Design Press. Temp. Ratings.

**TABLE 4 - TRIM DESIGNATION NUMBERS**

| Brass Trim | | Stainless Steel Trim Body Material | | | | Monel Trim | |
|---|---|---|---|---|---|---|---|
| Desig. | CODE | Desig. | BR. CODE | CI CODE | CS or SST CODE | Desig. | CODE |
| B0 ‡ | B0 | S0 ‡ | -- | S0 | S0 | M1 % | M1 |
| B1 ‡ | B1 | S1 ^ ‡ | S1 | S1 | S1 | M36 % | M6 |
| B2 | B2 | S2 ‡ | S2 | S2 | S2 | | |
| B3 | B3 | S2N | SN | SN | SN | | |
| B4 ^ | B4 | S3 | S3 | S3 | S3 | | |
| B5 ^ ‡ | B5 | S4 | S4 | S4 | S4 | | |
| BB | BB | S4N | SD | SD | SD | | |
| BJ ^ | BJ | S6 | -- | S6 | S6 | | |
| | | S7 ^ | S7 | S7 | S7 | | |
| | | S9 ‡ | -- | S9 | S9 | | |
| | | S36 ^ ‡ | 36 | 36 | 36 | | |
| | | S40 | 40 | 40 | 40 | | |
| | | S40T | -- | -- | 4T | | |
| | | SB | SB | SB | SB | | |
| | | SG | SG | SG | SG | | |
| | | SJ ^ | SJ | SJ | SJ | | |

^ Trim Designation Nos. useable for oxygen service.
‡ Trim Designation Nos. useable with Opt-80 spring range.
% For $O_2$ service above 290 psid.

**TABLE 5 - Product Classification Under European "Pressure Equipment Directive"**

| PRODUCT DESTINATION | HAZARD CATEGORY | CODE |
|---|---|---|
| Anywhere except Europe | N/A | 7 |
| European Countries * | Sound Engineering Practice (SEP) | S |

* For products to be placed in service in Europe - Ref to Directive 97/23/EC.
Forward Completed "EU" Application Recorder prior to quotation. (Without Recorder- Processing of Purchase Order will be delayed). Contact Cashco for Assistance.

**TABLE 6 - END CONNECTIONS**

| Description | CODE |
|---|---|
| NPT - Screwed | 1 |
| -30 Opt. - 150 LB RF Flgs. * (CS/SST Bodies-1/2",3/4", & 1" Sizes) (DN15, DN20, DN25 Sizes) | 6 |
| -30 Opt.- 300 LB RF Flgs. * (CS/SST Bodies-1/2",3/4", & 1" Sizes) (DN15, DN20, DN25 Sizes) | 7 |
| -31 Opt. - BSPT - Screwed Tapered Pipe Thread | B |
| -31P Opt. - BSPP - Screwed Parallel Pipe Thread | P |
| -32 Opt. - SCH. 80 PE Ext. Nipples * | E |

* Nipples & flanges of same material as body.
CS or SST bodies only.

**TABLE 7 - RANGE SPRINGS**

| Steel Range Spring | | CODE |
|---|---|---|
| psig | (Barg) | |
| 2-15 | (.14-1.0) | 1 |
| 10-40 | (.69-2.8) | 2 |
| 30-80 | (2.1-.5.5) | 3 |
| 70-150 | (4.8-10.3) | 4 |
| 100-250 (6.9-17.2) Opt. -80 only | | P |

**TABLE 8 - OPTIONS**

| Description | Option | CODE |
|---|---|---|
| No Option | --- | 0 |
| Handwheel & Locking Lever | -3 | 3 |
| Stabilizer | -4 | 4 |
| 1/8" (DN6) NPT Spring Chamber Vent Tap for CI, CS, SST mat'ls. (Is Standard with Brass Spring Chamber) | -25 | D |
| Plastic Rain-proof Bug Vent (includes Opt-25) | -25P | P |
| SST Rain-proof Bug Vent (includes Opt-25) | -25S | H |
| NACE Const: CS/CS/XX Per MR0175, S40, S40T Trims | -40 | J |
| NACE Const: SST/SST/XX Per MR0175, S40, S40T Trims | -40SST | K |
| Special Cleaning: Per Cashco Spec #S-1134. W/ properly selected mat'ls,this procedure suitable for oxygen service. BRZ or SST body material. | -55 | M |
| Special Cleaning: Per Cashco Spec #S-1542. All body/spring chamber materials. | -56 | N |
| 1/8" (DN6) NPT Body Tap: for output gauge connection. | -85 | T |
| Epoxy Painted Per Cashco Spec #S-1547 | -95 | W |
| Epoxy Painted Per Cashco Spec #S-1687 Offshore | -95OS | Y |
| For Special Construction Other Than Above, Contact Cashco for Special Product Code | | |

1. NUMERIC digits assigned first in "ascending" order.
2. ALPHA designations are assigned second in "alphabetical" order.
3. Left justify.
4. Add "0" to all unused squares.
5. If insufficient quantity of squares, consult factory for proper code.

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# Pressure Retaining Valve Type 586

## Compact, Easy to adjust, Flexible

### Benefits

***Easy Installation:***

- Compact design enables installation even when space is limited
- Radially dismountable
- Integrated assembling aid enables direct assembly of the valves to mounting sets
- Significantly shorter take-out length with union connections

***Easy Operation:***

- No re-torqueing needed anymore due to central housing nut
- Easily adjustable set pressure
- Constant and low vibrating control behavior
- Tightness resistant with temperature cycles
- Low-maintenance
- Pressure setting even during operation

***Flexible:***

- Manometer optional for neutral and aggressive media
- Various connection options due to the true union or spigot version.
- Low pressure spring set available
- Easy on spare parts due to modular design, one part might fit more than one valve

### Market Segments

• Water Treatment
• Chemical Process Industry
• Microelectronics
• Solar industry

### Function

The pressure retaining valve maintains the line pressure to a set value on the valve inlet. The inlet pressure is in direct relation to the flow. Independent of pressure fluctuations the system pressure stays largely constant.

### Flow Media

Neutral and aggressive media with low number of particles/ solids.
Depending on selected valve material mind the chemical resistance. → Please refer to Georg Fischer Piping System Chemical Resistance List

### Media Temperature

See pressure-/ temperature diagram

### Pressure Rating

PN 10 @ +20°C (150 psi @ 68°F)

### Set-Range

Standard: 0.5- 9.0 bar (7 – 130 psi)
Optional: 0.3 – 3 bar (4 – 44 psi)

### Hysteresis

Difference between opening and closing pressure:
Approx. 0.1 – 0.4 bar (1.5 – 5.8 psi)

### Dimensions

DN 10 - DN 50 (3/8” – 2”)

### Wetted Parts (Body, Piston, Inner-housing)
• PVC-U / CPVC (Polyvinylchlorid)
• PP (Polypropylen)
• PVDF (Polyvinylidenfluorid)

### Valve Housing
PP-GF (orange)

### Diaphragm
• EPDM/PTFE

### Seals
• EPDM
• FPM

### Connections
• Body with cementing resp. welding spigots
• Body true union type connection to match all standard GF unions and inserts (similar to diaphragm valve)

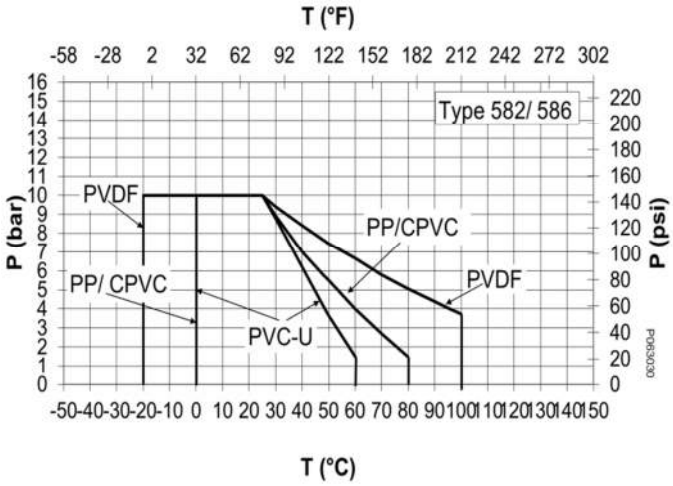
Available on request:
Various inserts from the GF range, e.g. transition to metal or PE.

### Mounting
Threaded inserts available for safe mounting

### Flow Direction
Always according to arrow on body

### Valve Function and Design
The piston/diaphragm position of the valve is in balance between the inlet pressure P1 (primary side) and set spring force.
If the inlet pressure rises above the set value, the diaphragm is lifted against the spring force. The valve opens until a balanced condition is reached again.
If the inlet pressure drops below the set value, the diaphragm is pressed down by the spring force. The valve starts closing until a balanced condition is reached again.
Hence the inlet pressure remains largely constant independent of increasing or decreasing system pressure (as long as the inlet pressure > set pressure).

### Pressure-Temperature Diagram
The following Pressure-Temperature Diagrams are based on a lifetime of 25 years with water or similar media.



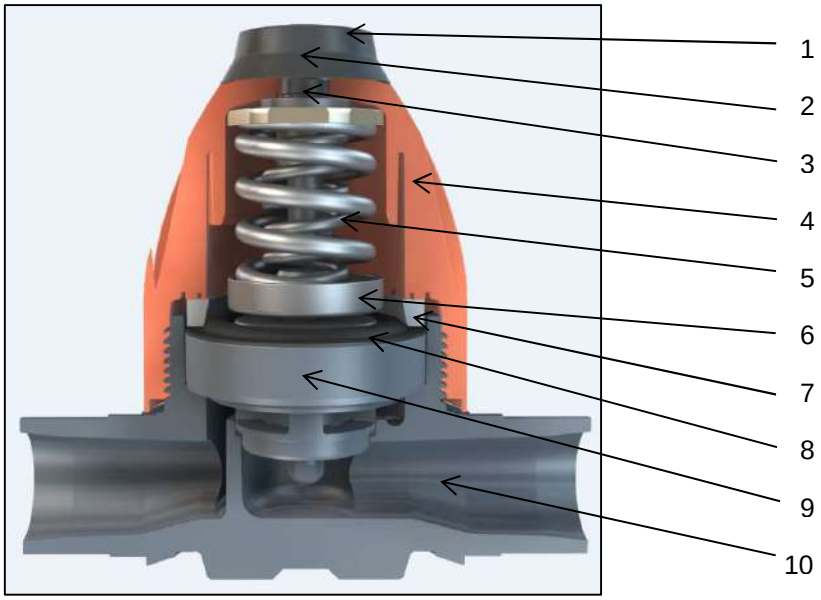

***P*** *Permissible pressure in bar, psi*
***T*** *Temperature in °C, °F*

### Flow Values
$K_{V100}$ @ delta p = 1 bar
$C_{V100}$ @ delta p= 1 psi

| DN [mm] | inch | d [mm] | $K_{V100}$ [L/min] | $K_{V100}$ [L/h] | $C_{V100}$ [gpm] |
|---|---|---|---|---|---|
| 10 | 3/8 | 16 | 50 | 3'020 | 3.5 |
| 15 | 1/2 | 20 | 53 | 3'150 | 3.6 |
| 20 | 3/4 | 25 | 114 | 6'840 | 7.9 |
| 25 | 1 | 32 | 125 | 7'500 | 8.6 |
| 32 | 1 1/4 | 40 | 263 | 15'760 | 18.1 |
| 40 | 1 1/2 | 50 | 286 | 17'140 | 19.7 |
| 50 | 2 | 63 | 293 | 17'610 | 20.2 |

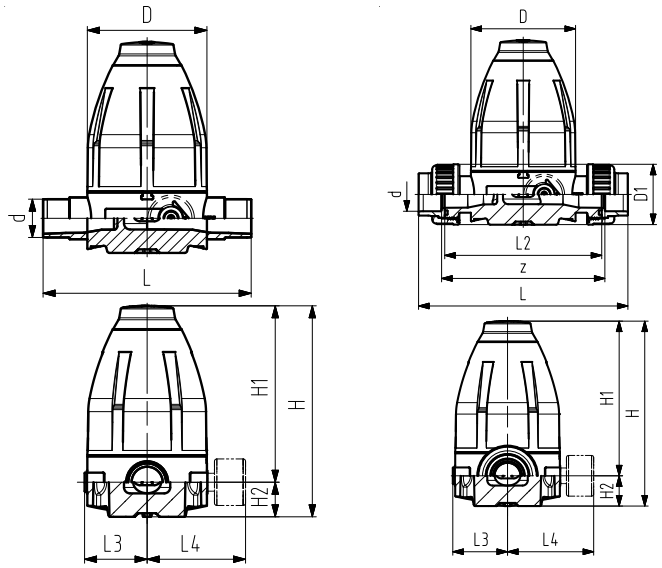
### Standards
• Tightness according to ISO 9393
• Leak rate according to EN 12266

## Sectional View Pressure Retaining Valve Type 586




| No. | Description |
|---|---|
| 1 | Protecting Cap |
| 2 | Lock-Nut |
| 3 | Spindle |
| 4 | Housing |
| 5 | Spring(s) |
| 6 | Spring Retainer |
| 7 | Retainer Ring |
| 8 | Diaphragm |
| 9 | Cartridge with Piston |
| 10 | Body |

## Dimensions Type 586 with Unions, Cementing resp. Welding Sockets



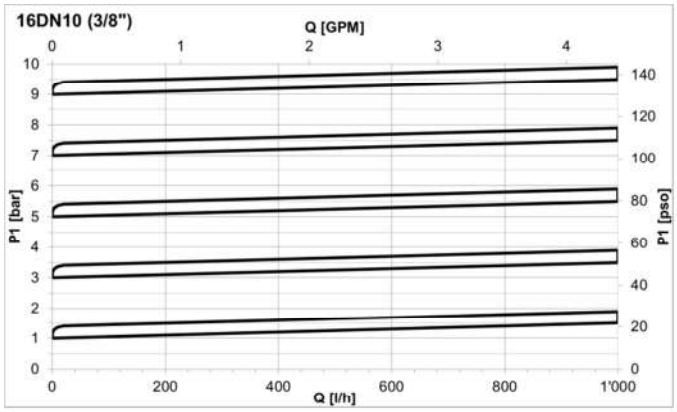

| | d (mm) | DN (mm) | DN (inch) | D | H | H1 | H2 |
|---|---|---|---|---|---|---|---|
| All Materials | 16 \| 20 | 10 \| 15 | 3/8 \| ½ | 79 | 132 | 111 | 21 |
| | 25 \| 32 | 20 \| 25 | ¾ \| 1 | 100 | 177 | 148 | 29 |
| | 40 \| 50 | 32 \| 40 | 1 ¼ \| 1 ½ | 147 | 251 | 207 | 44 |
| | 63 | 50 | 2 | 147 | 251 | 207 | 44 |

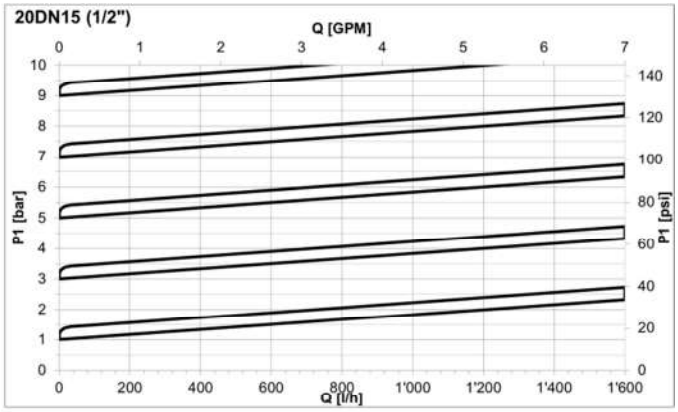
| | d (mm) | DN (mm) | DN (inch) | L* PVC/ PP | L* PVDF | L2 | L3 | L4 | z PVC/ PP | z PVDF |
|---|---|---|---|---|---|---|---|---|---|---|
| All Materials if not indicated | 16 \| 20 | 10 \| 15 | 3/8 \| ½ | 134 | 150 | 120 | 42 | 77 | 126 | 130 |
| | 25 \| 32 | 20 \| 25 | ¾ \| 1 | 174 | 190 | 150 | 53 | 88 | 156 | 160 |
| | 40 \| 50 | 32 \| 40 | 1 ¼ \| 1 ½ | 224 | 240 | 205 | 76 | 111 | 211 | 215 |
| | 63 | 50 | 2 | 244 | 260 | 205 | 76 | 111 | 211 | 215 |

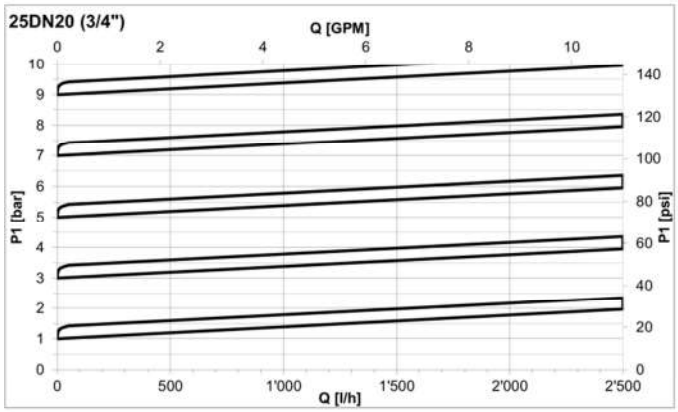
* L for Spigot Version only

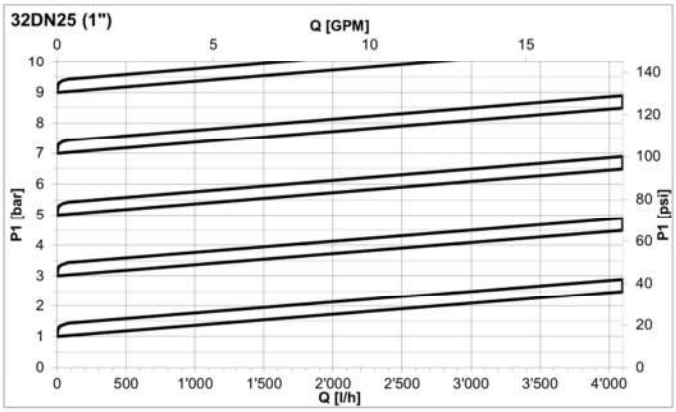
## Characteristic Curve Type 586

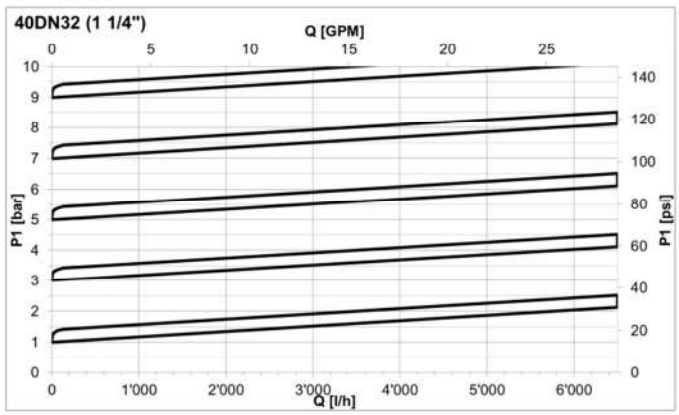
The curves below are valid for the set range 0.5- 9.0 bar (7 – 130 psi) and show the secondary or outlet pressure P2 over the flow Q in l/h. Parameter is the set pressure pE at Q = 0 l/h. There curves are valid for water at +20 °C for a flow velocity of 2 m/s. Special version set range 0.3 – 3 bar (4 – 44 psi) available on request.

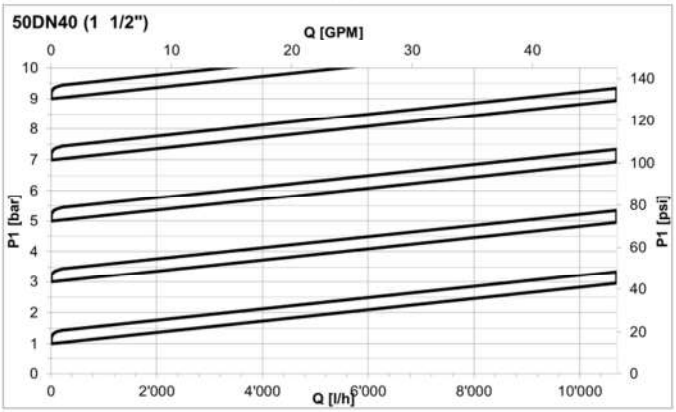


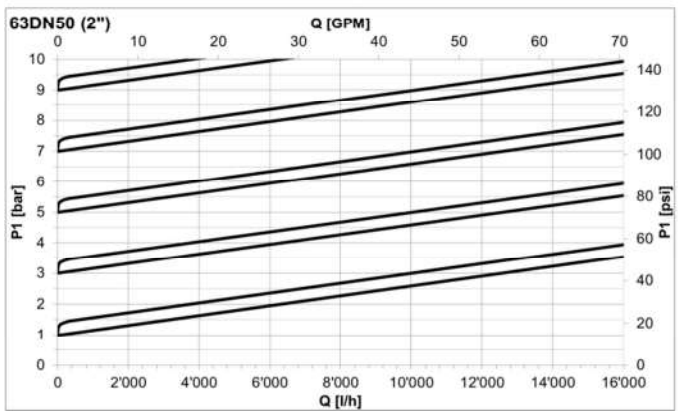



# Type 586 Pressure Retaining Valve


PVC Socket


CPVC Socket

All Type 586 Pressure Retaining Valves are sold without pressure gauges standard

## PVC

A

| Size | Socket | | | | Flanged | | | |
|---|---|---|---|---|---|---|---|---|
| [inch] | EPDM | | FPM | | EPDM | | FPM | |
| ½ | 161 586 202 | | 161 586 212 | | 161 586 602 | | 161 586 612 | |
| ¾ | 161 586 203 | | 161 586 213 | | 161 586 603 | | 161 586 613 | |
| 1 | 161 586 204 | | 161 586 214 | | 161 586 604 | | 161 586 614 | |
| 1 ¼ | 161 586 205 | | 161 586 215 | | 161 586 605 | | 161 586 615 | |
| 1 ½ | 161 586 206 | | 161 586 216 | | 161 586 606 | | 161 586 616 | |
| 2 | 161 586 207 | | 161 586 217 | | 161 586 607 | | 161 586 617 | |

## CPVC

A

| Size | Socket | | | | Flanged | | | |
|---|---|---|---|---|---|---|---|---|
| [inch] | EPDM | | FPM | | EPDM | | FPM | |
| ½ | 163 586 202 | | 163 586 212 | | 163 586 602 | | 163 586 612 | |
| ¾ | 163 586 203 | | 163 586 213 | | 163 586 603 | | 163 586 613 | |
| 1 | 163 586 204 | | 163 586 214 | | 163 586 604 | | 163 586 614 | |
| 1 ¼ | 163 586 205 | | 163 586 215 | | 163 586 605 | | 163 586 615 | |
| 1 ½ | 163 586 206 | | 163 586 216 | | 163 586 606 | | 163 586 616 | |
| 2 | 163 586 207 | | 163 586 217 | | 163 586 607 | | 163 586 617 | |

## PROGEF® Standard PP

A

| Size | Socket Fusion Spigot | | | | Socket Fusion Union | | | |
|---|---|---|---|---|---|---|---|---|
| [inch] | EPDM | | FPM | | EPDM | | FPM | |
| 20 | 167 586 002 | | 167 586 012 | | 167 586 102 | | 167 586 112 | |
| 25 | 167 586 003 | | 167 586 013 | | 167 586 103 | | 167 586 113 | |
| 32 | 167 586 004 | | 167 586 014 | | 167 586 104 | | 167 586 114 | |
| 40 | 167 586 005 | | 167 586 015 | | 167 586 105 | | 167 586 115 | |
| 50 | 167 586 006 | | 167 586 016 | | 167 586 106 | | 167 586 116 | |
| 63 | 167 586 007 | | 167 586 017 | | 167 586 107 | | 167 586 117 | |

| Size | IR/Butt Fusion Union | | |
|---|---|---|---|
| [inch] | EPDM | | FPM |
| 20 | 167 586 502 | | 167 586 512 |
| 25 | 167 586 503 | | 167 586 513 |
| 32 | 167 586 504 | | 167 586 514 |
| 40 | 167 586 505 | | 167 586 515 |
| 50 | 167 586 506 | | 167 586 516 |
| 63 | 167 586 507 | | 167 586 517 |


Socket Fusion Spigot


Socket Fusion Union

## SYGEF® Standard PVDF

A

| Size | Socket Fusion Spigot | | Socket Fusion Union | | IR/Butt Fusion Union |
|---|---|---|---|---|---|
| [inch] | FPM | | FPM | | FPM |
| 20 | 185 586 012 | | 185 586 112 | | 185 586 512 |
| 25 | 185 586 013 | | 185 586 113 | | 185 586 513 |
| 32 | 185 586 014 | | 185 586 114 | | 185 586 514 |
| 40 | 185 586 015 | | 185 586 115 | | 185 586 515 |
| 50 | 185 586 016 | | 185 586 116 | | 185 586 516 |
| 63 | 185 586 017 | | 185 586 117 | | 185 586 517 |


IR/Butt Fusion Union

# "Apollo" Valves
SUBMITTAL SHEET

# 500 Series
ASME Section VIII Safety Relief Valve

| | |
|---|---|
| Job Name: | |
| Job Location: | |
| Engineer: | |
| Contractor: | |
| Tag: | |
| PO#: | |
| Rep: | |
| Wholesale Dist.: | |

## DESCRIPTION
ASME Section VIII capacity certified safety relief valve for overpressure protection of steam, air/gas and liquid systems, pressure vessels, piping and similar equipment.

## FEATURES
- ASME Section VIII Certified Capacities
- 5 - 1200 psig Set Pressures @ 800° F max*
- 1/2" - 2" Inlet Connections
- Bronze, Carbon or Stainless Steel Construction
- Lapped Metal Seats; O-ring and PCTFE Seats Optional
- Screwed Cap or Packed Lift Lever Configuration
- **Made in the USA**

## APPROVALS
- ASME Section VIII Div 1 Pressure Vessels for Steam, Air/Gas and Liquids
- CRN 0G8547.5C
- Directive 2011/65/CE (RoHS) Compliant (530-540)
- Pressure Equipment Directive 2014/68/EU (PED)
- Oxygen Cleaning to CGA 4.1 (Optional)

***Set pressures and temperatures vary by model.***
***Refer to catalog for sizing and selection information***

## STANDARD MATERIALS LIST

| | |
|---|---|
| **BODY** | ASTM B584 Bronze<br>ASTM A216 Carbon Steel<br>ASTM A351 Stainless Steel |
| **NOZZLE** | ASTM B16 Brass<br>ASTM A479 Stainless Steel |
| **SPRING** | Stainless Steel |
| **SEAT** | Stainless Steel |

## CAPACITY, SCFM (NM3/HR)
### NATIONAL BOARD CAPACITY CERTIFIED, SECTION VIII AIR

| SET PRESSURE PSIG (BAR) | D ORIFICE | E ORIFICE | F ORIFICE |
|---|---|---|---|
| 15 (1.03) | 67 (107) | 118 (189) | 185 (298) |
| 100 (6.90) | 255 (409) | 449 (721) | 706 (1135) |
| 500 (34.48) | 1153 (1853) | 2032 (3267) | 3197 (5138) |
| **SET PRESSURE PSIG (BAR)** | **G ORIFICE** | **H ORIFICE** | **J ORIFICE** |
| 15 (1.03) | 304 (488) | 474 (762) | 776 (1247) |
| 100 (6.90) | 1158 (1862) | 1808 (2907) | 2959 (4756) |
| 500 (34.48) | 5246 (8433) | 8189 (13164) | 13399 (21538) |

## AVAILABLE CONFIGURATIONS

| MODEL NUMBER | ORIFICE | SIZE | INSTALLED HEIGHT IN. (MM) |
|---|---|---|---|
| 5xxDCB | D | 1/2M x 1F | 6.97 (177) |
| 5xxDCD* | | 1/2M x 3/4F | 6.97 (177) |
| 5xxDDB | | 3/4M x 1F | 6.97 (177) |
| 5xxDDD* | | 3/4M x 3/4F | 6.97 (177) |
| 5xxED | E | 3/4M x 1-1/4F | 8.45 (215) |
| 5xxEE | | 1M x 1-1/4F | 8.45 (215) |
| 5xxFE | F | 1M x 1-1/2F | 9.64 (245) |
| 5xxFF | | 1-1/4M x 1-1/2F | 9.64 (245) |
| 5xxGF | G | 1-1/4M x 2F | 12.62 (321) |
| 5xxGG | | 1-1/2M x 2F | 12.62 (321) |
| 5xxHG | H | 1-1/2M x 2-1/2F | 14.42 (367) |
| 5xxHH | | 2M x 2-1/2F | 14.42 (367) |
| 5xxJH | J | 2M x 3F | 16.50 (419) |

*Bronze Body Only*

## PART NUMBER MATRIX

| 52 | 3 | J | H | B | K | M | AA | 0425 | Q |
|---|---|---|---|---|---|---|---|---|---|
| SERIES BODY/ TRIM MATERIAL | CAP | ORIFICE LETTER | INLET SIZE | CONNECTION | SERVICE | SEAT | SPECIAL OPTIONS | SET PRESSURE | SUFFIX |
| 51 - BRONZE/BRASS | 1 - SCREWED CAP | D | C - 1/2" | B - MNPT X NPT | J - SEC VIII LIQUID | M - METAL | FACTORY ISSUED LETTERS/NUMBERS FOR SPECIAL OPTIONS OR FEATURES | SET PRESSURE, PSIG (4 DIGITS) | Q - PERFORMANCE (CALIBRATION) TEST REPORTS |
| 52 - BRONZE/STAINLESS | 2 - SCREWED + GAG | E | D - 3/4" | D - 3/4 OUTLET (MODEL 510 & 520 D ORIFICE ONLY) | K - SEC VIII AIR/GAS | B - BUNA-N | | | |
| 53 - CARBON/STAINLESS | 3 - PACKED LEVER | F | E - 1" | | L - SEC VIII STEAM | E - EPR | | VACUUM "HG" PREFIX + 2 DIGITS | |
| 54 - ALL STAINLESS | 4 - PACKED + GAG | G | F - 1-1/4" | | M - NON CODE LIQUID | K - PCTFE | | | |
| | | H | G - 1-1/2" | | N - NON CODE AIR | N - NEOPRENE | "AA" - DEFAULT SETTING | | |
| | | J | H - 2" | | P - NON CODE STEAM | Z - KALREZ® | "CE" - CE/PED | | |
| | | | | | Q - VACUUM | S - SILICONE | "HT" - HIGH TEMP SPRING | | |
| | | | | | | V - VITON | "OX" - CLEANED FOR OXYGEN | | |

*Not all configurations available together*

## 500 SERIES
MULTI-PURPOSE SAFETY RELIEF

## ASME SECTION VIII - STEAM
- Pounds per hour (kilograms per hour) saturated steam at 10% overpressure. National Board Certified. Ratings are 90% of actual.

### US CUSTOMARY UNITS LB/HR.

| ORIFICE LETTER AREA (IN.²) | D 0.1295 | E 0.2282 | F 0.3589 | G 0.5890 | H 0.9195 | J 1.5044 |
|---|---|---|---|---|---|---|
| SET PRESSURE PSIG | | | | | | |
| 5* | 122 | 216 | 339 | 557 | 869 | 1,422 |
| 10* | 168 | 295 | 465 | 762 | 1,190 | 1,947 |
| 15 | 188 | 331 | 520 | 853 | 1,332 | 2,180 |
| 20 | 216 | 381 | 600 | 984 | 1,536 | 2,513 |
| 25 | 245 | 432 | 679 | 1,114 | 1,740 | 2,846 |
| 30 | 274 | 482 | 759 | 1,245 | 1,943 | 3,180 |
| 35 | 305 | 538 | 846 | 1,388 | 2,168 | 3,546 |
| 40 | 337 | 593 | 934 | 1,532 | 2,392 | 3,913 |
| 45 | 368 | 649 | 1,021 | 1,676 | 2,616 | 4,280 |
| 50 | 400 | 705 | 1,108 | 1,819 | 2,840 | 4,646 |
| 55 | 431 | 760 | 1,196 | 1,963 | 3,064 | 5,013 |
| 60 | 463 | 816 | 1,283 | 2,106 | 3,288 | 5,380 |
| 65 | 494 | 872 | 1,371 | 2,250 | 3,512 | 5,746 |
| 70 | 526 | 927 | 1,458 | 2,393 | 3,736 | 6,113 |
| 75 | 558 | 983 | 1,546 | 2,537 | 3,960 | 6,479 |
| 80 | 589 | 1,038 | 1,633 | 2,680 | 4,184 | 6,846 |
| 85 | 621 | 1,094 | 1,721 | 2,824 | 4,408 | 7,213 |
| 90 | 652 | 1,150 | 1,808 | 2,968 | 4,632 | 7,579 |
| 95 | 684 | 1,205 | 1,896 | 3,111 | 4,857 | 7,946 |
| 100 | 715 | 1,261 | 1,983 | 3,255 | 5,081 | 8,313 |
| 125 | 873 | 1,539 | 2,421 | 3,972 | 6,201 | 10,146 |
| 150 | 1,031 | 1,817 | 2,858 | 4,690 | 7,322 | 11,979 |
| 175 | 1,189 | 2,095 | 3,295 | 5,408 | 8,442 | 13,812 |
| 200 | 1,346 | 2,373 | 3,733 | 6,126 | 9,562 | 15,645 |
| 225 | 1,504 | 2,651 | 4,170 | 6,843 | 10,683 | 17,478 |
| 250 | 1,662 | 2,929 | 4,607 | 7,561 | 11,803 | 19,312 |
| 275 | 1,820 | 3,207 | 5,045 | 8,279 | 12,924 | 21,145 |
| 300 | 1,977 | 3,485 | 5,482 | 8,997 | 14,044 | 22,978 |
| 325 | 2,135 | 3,763 | 5,919 | 9,714 | 15,165 | 24,811 |
| 350 | 2,293 | 4,041 | 6,357 | 10,432 | 16,285 | 26,644 |
| 375 | 2,451 | 4,319 | 6,794 | 11,150 | 17,405 | 28,477 |
| 400 | 2,608 | 4,597 | 7,231 | 11,867 | 18,526 | 30,311 |
| 425 | 2,766 | 4,875 | 7,669 | 12,585 | 19,646 | 32,144 |
| 450 | 2,924 | 5,153 | 8,106 | 13,303 | 20,767 | 33,977 |
| 475 | 3,082 | 5,431 | 8,543 | 14,021 | 21887 | 35,810 |
| 500 | 3,239 | 5,709 | 8,981 | 14,738 | 23,008 | 37,643 |
| 525 | 3,397 | 5,987 | 9,418 | 15,456 | - | - |
| 550 | 3,555 | 6,266 | 9,855 | 16,174 | - | - |
| 575 | 3,713 | 6,544 | 10,293 | 16,892 | - | - |
| 600 | 3,870 | 6,822 | 10,730 | 17,609 | - | - |
| 625 | 4,028 | 7,100 | - | - | - | - |
| 650 | 4,186 | 7,378 | - | - | - | - |
| 675 | 4,344 | 7,656 | - | - | - | - |
| 700 | 4,501 | 7,934 | - | - | - | - |
| 725 | 4,659 | 8,212 | - | - | - | - |
| 750 | 4,817 | 8,490 | - | - | - | - |
| 775 | 4,975 | 8,768 | - | - | - | - |
| 800 | 5,132 | 9,046 | - | - | - | - |
| 825 | 5,290 | 9,324 | - | - | - | - |
| 850 | 5,448 | 9,602 | - | - | - | - |
| 875 | 5,606 | 9,880 | - | - | - | - |
| 900 | 5,763 | 10,158 | - | - | - | - |
| Approx. 1 psi Increment | 6.3 | 11.1 | 17.5 | 28.7 | 44.8 | 73.3 |

### METRIC UNITS KG/HR.

| ORIFICE LETTER AREA (CM.²) | D 0.8352 | E 1.4721 | F 2.3155 | G 3.8001 | H 5.9321 | J 9.7058 |
|---|---|---|---|---|---|---|
| SET PRESSURE BARG | | | | | | |
| 0.4* | 60 | 105 | 165 | 271 | 423 | 692 |
| 0.8* | 82 | 145 | 228 | 374 | 583 | 955 |
| 1.1 | 88 | 154 | 243 | 398 | 622 | 1,018 |
| 2 | 122 | 214 | 337 | 553 | 863 | 1,412 |
| 3 | 163 | 287 | 451 | 741 | 1,156 | 1,892 |
| 4 | 204 | 360 | 566 | 930 | 1,451 | 2,374 |
| 5 | 246 | 433 | 681 | 1,118 | 1,746 | 2,857 |
| 6 | 287 | 506 | 797 | 1,307 | 2,041 | 3,339 |
| 7 | 329 | 580 | 912 | 1,496 | 2,336 | 3,821 |
| 8 | 370 | 653 | 1,027 | 1,685 | 2,630 | 4,304 |
| 9 | 412 | 726 | 1,142 | 1,874 | 2,925 | 4,786 |
| 10 | 453 | 799 | 1,257 | 2,063 | 3,220 | 5,269 |
| 12 | 536 | 945 | 1,487 | 2,441 | 3,810 | 6,233 |
| 14 | 619 | 1,092 | 1,717 | 2,818 | 4,400 | 7,198 |
| 16 | 702 | 1,238 | 1,947 | 3,196 | 4,989 | 8,163 |
| 18 | 786 | 1,384 | 2,178 | 3,574 | 5,579 | 9,128 |
| 20 | 869 | 1,531 | 2,408 | 3,952 | 6,169 | 10,093 |
| 22 | 952 | 1,677 | 2,638 | 4,329 | 6,758 | 11,058 |
| 24 | 1,035 | 1,823 | 2,868 | 4,707 | 7,348 | 12,022 |
| 26 | 1,118 | 1,970 | 3,098 | 5,085 | 7,938 | 12,987 |
| 28 | 1,201 | 2,116 | 3,329 | 5,463 | 8,527 | 13,952 |
| 30 | 1,284 | 2,262 | 3,559 | 5,840 | 9,117 | 14,917 |
| 32 | 1,367 | 2,409 | 3,789 | 6,218 | 9,707 | 15,882 |
| 34 | 1,450 | 2,555 | 4,019 | 6,596 | 10,297 | 16,846 |
| 36 | 1,533 | 2,701 | 4,249 | 6,974 | - | - |
| 38 | 1,616 | 2,848 | 4,479 | 7,351 | - | - |
| 40 | 1,699 | 2,994 | 4,710 | 7,729 | - | - |
| 42 | 1,782 | 3,140 | - | - | - | - |
| 44 | 1,865 | 3,287 | - | - | - | - |
| 46 | 1,948 | 3,433 | - | - | - | - |
| 48 | 2,031 | 3,579 | - | - | - | - |
| 50 | 2,114 | 3,726 | - | - | - | - |
| 52 | 2,197 | 3,872 | - | - | - | - |
| 54 | 2,280 | 4,019 | - | - | - | - |
| 58 | 2,446 | 4,311 | - | - | - | - |
| 62 | 2,612 | 4,604 | - | - | - | - |
| 65 | 2,736 | - | - | - | - | - |
| 69 | 2,902 | - | - | - | - | - |
| 72 | 3,026 | - | - | - | - | - |
| 76 | 3,192 | - | - | - | - | - |
| 79 | 3,316 | - | - | - | - | - |
| 82 | 3,441 | - | - | - | - | - |
| Approx. 0.1 bar Increment | 4.15 | 7.32 | 11.51 | 18.89 | 29.48 | 48.24 |

*Maximum Set Pressure Limits for Steam Service*
*510 Series - 250 psig/17.3 barg*
*520 Series - 300 psig/20.7 barg*
*530 Series - 900 psig/62.1 barg*
*540 Series - 900 psig/62.1 barg*
*Note: For steam service beyond 300 psig or 550˚F specify option "HT" high temperature stainless steel alloy spring.*
**Pressure settings below 15 psig/1.03 barg are non-ASME code.*

## 500 SERIES
MULTI-PURPOSE SAFETY RELIEF

## ASME SECTION VIII - AIR
Standard cubic feet per minute (normalized cubic meters per hour) of air at 10% overpressure. National Board Certified. Ratings are 90% of actual.

### US CUSTOMARY UNITS SCFM

| ORIFICE LETTER AREA (IN.²) | D 0.1295 | E 0.2282 | F 0.3589 | G 0.5890 | H 0.9195 | J 1.5044 |
|---|---|---|---|---|---|---|
| SET PRESSURE PSIG | | | | | | |
| 5* | 39 | 69 | 108 | 178 | 277 | 454 |
| 10* | 54 | 96 | 151 | 248 | 387 | 633 |
| 15 | 67 | 118 | 185 | 304 | 474 | 776 |
| 20 | 77 | 136 | 213 | 350 | 547 | 895 |
| 25 | 87 | 154 | 242 | 397 | 619 | 1,013 |
| 30 | 97 | 172 | 270 | 443 | 692 | 1,132 |
| 35 | 109 | 191 | 301 | 494 | 772 | 1,262 |
| 40 | 120 | 211 | 332 | 545 | 851 | 1,393 |
| 45 | 131 | 231 | 363 | 596 | 931 | 1,523 |
| 50 | 142 | 251 | 395 | 648 | 1,011 | 1,654 |
| 55 | 154 | 271 | 426 | 699 | 1,091 | 1,784 |
| 60 | 165 | 290 | 457 | 750 | 1,170 | 1,915 |
| 65 | 176 | 310 | 488 | 801 | 1,250 | 2,045 |
| 70 | 187 | 330 | 519 | 852 | 1,330 | 2,176 |
| 75 | 198 | 350 | 550 | 903 | 1,410 | 2,306 |
| 80 | 210 | 370 | 581 | 954 | 1,489 | 2,437 |
| 85 | 221 | 389 | 612 | 1,005 | 1,569 | 2,567 |
| 90 | 232 | 409 | 644 | 1,056 | 1,649 | 2,698 |
| 95 | 243 | 429 | 675 | 1,107 | 1,729 | 2,828 |
| 100 | 255 | 449 | 706 | 1,158 | 1,808 | 2,959 |
| 125 | 311 | 548 | 862 | 1,414 | 2,207 | 3,611 |
| 150 | 367 | 647 | 1,017 | 1,669 | 2,606 | 4,264 |
| 175 | 423 | 746 | 1,173 | 1,925 | 3,005 | 4,916 |
| 200 | 479 | 845 | 1,329 | 2,180 | 3,404 | 5,569 |
| 225 | 535 | 944 | 1,484 | 2,436 | 3,802 | 6,221 |
| 250 | 592 | 1,043 | 1,640 | 2,691 | 4,201 | 6,874 |
| 275 | 648 | 1,142 | 1,796 | 2,947 | 4,600 | 7,526 |
| 300 | 704 | 1,240 | 1,951 | 3,202 | 4,999 | 8,179 |
| 325 | 760 | 1,339 | 2,107 | 3,458 | 5,398 | 8,831 |
| 350 | 816 | 1,438 | 2,263 | 3,713 | 5,796 | 9,484 |
| 375 | 872 | 1,537 | 2,418 | 3,969 | 6,195 | 10,136 |
| 400 | 928 | 1,636 | 2,574 | 4,224 | 6,594 | 10,789 |
| 425 | 985 | 1,735 | 2,730 | 4,480 | 6,993 | 11,441 |
| 450 | 1,041 | 1,834 | 2,885 | 4,735 | 7,392 | 12,094 |
| 475 | 1,097 | 1,933 | 3,041 | 4,991 | 7,791 | 12,746 |
| 500 | 1,153 | 2,032 | 3,197 | 5,246 | 8,189 | 13,399 |
| 525 | 1,209 | 2,131 | 3,352 | 5,501 | - | - |
| 550 | 1,265 | 2,230 | 3,508 | 5,757 | - | - |
| 575 | 1,321 | 2,329 | 3,664 | 6,012 | - | - |
| 600 | 1,378 | 2,428 | 3,819 | 6,268 | - | - |
| 625 | 1,434 | 2,527 | - | - | - | - |
| 650 | 1,490 | 2,626 | - | - | - | - |
| 675 | 1,546 | 2,725 | - | - | - | - |
| 700 | 1,602 | 2,824 | - | - | - | - |
| 725 | 1,658 | 2,923 | - | - | - | - |
| 750 | 1,715 | 3,022 | - | - | - | - |
| 775 | 1,771 | 3,121 | - | - | - | - |
| 800 | 1,827 | 3,220 | - | - | - | - |
| 825 | 1,883 | 3,319 | - | - | - | - |
| 850 | 1,939 | 3,418 | - | - | - | - |
| 875 | 1,995 | 3,517 | - | - | - | - |
| 900 | 2,051 | 3,616 | | | | |
| 950 | 2,163 | - | - | - | - | - |
| 1000 | 2,276 | - | - | - | - | - |
| 1050 | 2,388 | - | - | - | - | - |
| 1100 | 2,501 | - | - | - | - | - |
| 1150 | 2,613 | - | - | - | - | - |
| 1200 | 2,725 | - | - | - | - | - |
| Approx.1 psi Increment | 2.2 | 4.0 | 6.2 | 10.2 | 16.0 | 26.1 |

### METRIC UNITS KG/HR.

| ORIFICE LETTER AREA (CM²) | D 0.8352 | E 1.4721 | F 2.3155 | G 3.8001 | H 5.9321 | J 9.7058 |
|---|---|---|---|---|---|---|
| SET PRESSURE BARG | | | | | | |
| 0.4* | 67 | 119 | 187 | 307 | 479 | 784 |
| 0.8* | 94 | 165 | 260 | 427 | 667 | 1,091 |
| 1.1 | 110 | 195 | 306 | 503 | 784 | 1,283 |
| 2 | 153 | 270 | 425 | 697 | 1,089 | 1,781 |
| 3 | 205 | 362 | 569 | 934 | 1,458 | 2,386 |
| 4 | 258 | 454 | 714 | 1,172 | 1,830 | 2,994 |
| 5 | 310 | 546 | 859 | 1,411 | 2,202 | 3,603 |
| 6 | 362 | 639 | 1,005 | 1,649 | 2,574 | 4,211 |
| 7 | 415 | 731 | 1,150 | 1,887 | 2,946 | 4,819 |
| 8 | 467 | 823 | 1,295 | 2,125 | 3,317 | 5,428 |
| 9 | 519 | 916 | 1,440 | 2,363 | 3,689 | 6,036 |
| 10 | 572 | 1,008 | 1,585 | 2,601 | 4,061 | 6,644 |
| 12 | 676 | 1,192 | 1,875 | 3,078 | 4,805 | 7,861 |
| 14 | 781 | 1,377 | 2,166 | 3,554 | 5,548 | 9,078 |
| 16 | 886 | 1,561 | 2,456 | 4,031 | 6,292 | 10,295 |
| 18 | 991 | 1,746 | 2,746 | 4,507 | 7,036 | 11,511 |
| 20 | 1,095 | 1,931 | 3,037 | 4,983 | 7,779 | 12,728 |
| 22 | 1,200 | 2,115 | 3,327 | 5,460 | 8,523 | 13,945 |
| 24 | 1,305 | 2,300 | 3,617 | 5,936 | 9,267 | 15,162 |
| 26 | 1,409 | 2,484 | 3,907 | 6,413 | 10,010 | 16,378 |
| 28 | 1,514 | 2,669 | 4,198 | 6,889 | 10,754 | 17,595 |
| 30 | 1,619 | 2,853 | 4,488 | 7,365 | 11,498 | 18,812 |
| 32 | 1,724 | 3,038 | 4,778 | 7,842 | 12,241 | 20,029 |
| 34 | 1,828 | 3,222 | 5,069 | 8,318 | 12,985 | 21,245 |
| 36 | 1,933 | 3,407 | 5,359 | 8,795 | - | - |
| 38 | 2,038 | 3,591 | 5,649 | 9,271 | - | - |
| 40 | 2,142 | 3,776 | 5,939 | 9,747 | - | - |
| 42 | 2,247 | 3,961 | - | - | - | - |
| 44 | 2,352 | 4,145 | - | - | - | - |
| 46 | 2,457 | 4,330 | - | - | - | - |
| 48 | 2,561 | 4,514 | - | - | - | - |
| 50 | 2,666 | 4,699 | - | - | - | - |
| 52 | 2,771 | 4,883 | - | - | - | - |
| 54 | 2,875 | 5,068 | - | - | - | - |
| 58 | 3,085 | 5,437 | - | - | - | - |
| 62 | 3,294 | 5,806 | - | - | - | - |
| 65 | 3,450 | - | - | - | - | - |
| 69 | 3,659 | - | - | - | - | - |
| 72 | 3,815 | - | - | - | - | - |
| 76 | 4,020 | - | - | - | - | - |
| 79 | 4,177 | - | - | - | - | - |
| 82 | 4,381 | - | - | - | - | - |
| Approx. 0.1 bar Increment | 5.24 | 9.23 | 14.51 | 23.82 | 37.18 | 60.84 |

*Maximum Set Pressure Limits for Air/Gas Service*
*510 Series - 300 psig/20.7 barg*
*520 Series - 1200 psig/82.7 barg*
*530 Series - 1200 psig/82.7 barg*
*540 Series - 1200 psig/82.7 barg*

## 500 SERIES
MULTI-PURPOSE SAFETY RELIEF

## ASME SECTION VIII - WATER
- U.S. gallons per minute (cubic meters per hour) of water at 10% over pressure. National Board Certified. Ratings are 90% of actual.

### US CUSTOMARY UNITS GPM

| ORIFICE LETTER AREA (IN.²) | D 0.1295 | E 0.2282 | F 0.3589 | G 0.5890 | H 0.9195 | J 1.5044 |
|---|---|---|---|---|---|---|
| SET PRESSURE PSIG | | | | | | |
| 5* | 13 | 24 | 37 | 61 | 95 | 156 |
| 10* | 14 | 24 | 38 | 63 | 98 | 161 |
| 15 | 14 | 25 | 40 | 65 | 102 | 167 |
| 20 | 16 | 29 | 45 | 74 | 115 | 189 |
| 25 | 18 | 32 | 50 | 82 | 127 | 208 |
| 30 | 19 | 34 | 54 | 89 | 138 | 226 |
| 35 | 21 | 37 | 58 | 96 | 149 | 244 |
| 40 | 22 | 40 | 62 | 102 | 160 | 261 |
| 45 | 24 | 42 | 66 | 108 | 169 | 277 |
| 50 | 25 | 44 | 70 | 114 | 178 | 292 |
| 55 | 26 | 46 | 73 | 120 | 187 | 306 |
| 60 | 28 | 48 | 76 | 125 | 195 | 320 |
| 65 | 29 | 50 | 79 | 130 | 203 | 333 |
| 70 | 30 | 52 | 82 | 135 | 211 | 345 |
| 75 | 31 | 54 | 85 | 140 | 218 | 357 |
| 80 | 32 | 56 | 88 | 145 | 226 | 369 |
| 85 | 33 | 58 | 91 | 149 | 233 | 381 |
| 90 | 34 | 59 | 93 | 153 | 239 | 392 |
| 95 | 35 | 61 | 96 | 158 | 246 | 402 |
| 100 | 36 | 63 | 98 | 162 | 252 | 413 |
| 125 | 40 | 70 | 110 | 181 | 282 | 462 |
| 150 | 44 | 77 | 121 | 198 | 309 | 506 |
| 175 | 47 | 83 | 130 | 214 | 334 | 546 |
| 200 | 50 | 89 | 139 | 229 | 357 | 584 |
| 225 | 53 | 94 | 148 | 242 | 378 | 619 |
| 250 | 56 | 99 | 156 | 256 | 399 | 653 |
| 275 | 59 | 104 | 163 | 268 | 418 | 685 |
| 300 | 62 | 108 | 171 | 280 | 437 | 715 |
| 325 | 64 | 113 | 178 | 291 | 455 | 744 |
| 350 | 66 | 117 | 184 | 302 | 472 | 772 |
| 375 | 69 | 121 | 191 | 313 | 489 | 799 |
| 400 | 71 | 125 | 197 | 323 | 505 | 826 |
| 425 | 73 | 129 | 203 | 333 | 520 | 851 |
| 450 | 75 | 133 | 209 | 343 | 535 | 876 |
| 475 | 77 | 136 | 215 | 352 | 550 | 900 |
| 500 | 79 | 140 | 220 | 361 | 564 | 923 |
| 525 | 81 | 143 | 226 | 370 | - | - |
| 550 | 83 | 147 | 231 | 379 | - | - |
| 575 | 85 | 150 | 236 | 388 | - | - |
| 600 | 87 | 153 | 241 | 396 | - | - |
| 625 | 89 | 157 | - | - | - | - |
| 650 | 91 | 160 | - | - | - | - |
| 675 | 92 | 163 | - | - | - | - |
| 700 | 94 | 166 | - | - | - | - |
| 725 | 96 | 169 | - | - | - | - |
| 750 | 97 | 171 | - | - | - | - |
| 775 | 99 | 174 | - | - | - | - |
| 800 | 100 | 177 | - | - | - | - |
| 825 | 102 | 180 | - | - | - | - |
| 850 | 104 | 183 | - | - | - | - |
| 875 | 105 | 185 | - | - | - | - |
| 900 | 107 | 188 | - | - | - | - |
| 950 | 109 | - | - | - | - | - |
| 1000 | 112 | - | - | - | - | - |

### METRIC UNITS M3/HR.

| ORIFICE LETTER AREA (CM²) | D 0.8352 | E 1.4721 | F 2.3155 | G 3.8001 | H 5.9321 | J 9.7058 |
|---|---|---|---|---|---|---|
| SET PRESSURE BARG | | | | | | |
| 0.4* | 2.0 | 3.6 | 5.6 | 9.2 | 14.4 | 23.6 |
| 0.8* | 2.9 | 5.1 | 8.0 | 13.1 | 20.4 | 33.3 |
| 1.1 | 3.3 | 5.9 | 9.3 | 15.2 | 23.8 | 38.9 |
| 2 | 4.4 | 7.7 | 12.1 | 19.8 | 30.9 | 50.6 |
| 3 | 5.3 | 9.4 | 14.8 | 24.2 | 37.8 | 61.8 |
| 4 | 6.1 | 10.8 | 17.0 | 28.0 | 43.6 | 71.4 |
| 5 | 6.9 | 12.1 | 19.0 | 31.3 | 48.8 | 79.8 |
| 6 | 7.5 | 13.3 | 20.9 | 34.2 | 53.4 | 87.4 |
| 7 | 8.1 | 14.3 | 22.5 | 37.0 | 57.7 | 94.5 |
| 8 | 8.7 | 15.3 | 24.1 | 39.5 | 61.7 | 101.0 |
| 9 | 9.2 | 16.2 | 25.6 | 41.9 | 65.5 | 107.1 |
| 10 | 9.7 | 17.1 | 26.9 | 44.2 | 69.0 | 112.9 |
| 12 | 10.6 | 18.8 | 29.5 | 48.4 | 75.6 | 123.7 |
| 14 | 11.5 | 20.3 | 31.9 | 52.3 | 81.6 | 133.6 |
| 16 | 12.3 | 21.7 | 34.1 | 55.9 | 87.3 | 142.8 |
| 18 | 13.0 | 23.0 | 36.1 | 59.3 | 92.6 | 151.5 |
| 20 | 13.7 | 24.2 | 38.1 | 62.5 | 97.6 | 159.7 |
| 22 | 14.4 | 25.4 | 39.9 | 65.6 | 102.3 | 167.5 |
| 24 | 15.1 | 26.5 | 41.7 | 68.5 | 106.9 | 174.9 |
| 26 | 15.7 | 27.6 | 43.4 | 71.3 | 111.3 | 182.0 |
| 28 | 16.3 | 28.7 | 45.1 | 74.0 | 115.5 | 188.9 |
| 30 | 16.8 | 29.7 | 46.7 | 76.6 | 119.5 | 195.5 |
| 32 | 17.4 | 30.6 | 48.2 | 79.1 | 123.4 | 202.0 |
| 34 | 17.9 | 31.6 | 49.7 | 81.5 | 127.2 | 208.2 |
| 36 | 18.4 | 32.5 | 51.1 | 83.9 | - | - |
| 38 | 18.9 | 33.4 | 52.5 | 86.2 | - | - |
| 40 | 19.4 | 34.2 | 53.9 | 88.4 | - | - |
| 42 | 19.9 | 35.1 | - | - | - | - |
| 44 | 20.4 | 35.9 | - | - | - | - |
| 46 | 20.8 | 36.7 | - | - | - | - |
| 48 | 21.3 | 37.5 | - | - | - | - |
| 50 | 21.7 | 38.3 | - | - | - | - |
| 52 | 22.2 | 39.0 | - | - | - | - |
| 54 | 22.6 | 39.8 | - | - | - | - |
| 58 | 23.4 | 41.2 | - | - | - | - |
| 62 | 24.2 | 42.6 | - | - | - | - |
| 65 | 24.8 | - | - | - | - | - |
| 69 | 25.6 | - | - | - | - | - |

*Maximum Set Pressure Limits for Liquid Service*
*510 Series - 300 psig/20.7 barg*
*520 Series - 1000 psig/68.9 barg*
*530 Series - 1000 psig/68.9 barg*
*540 Series - 1000 psig/68.9 barg*

*Note:*
*To determine water capacity at 25% overpressure, multiply the capacity at 10% by 1.066.*
**Pressure settings below 15 psig/1.03 barg are non-ASME code.*

# Bourdon Tube Pressure Gauges
# Industrial Stainless Steel Gauge
# Type 232.54 - Dry Case
# Type 233.54 - Liquid-filled Case



## Applications

- Intended for adverse service conditions where pulsating or vibration exists
- Process industry: chemical/petrochemical, power stations, mining, on and offshore, environmental technology, mechanical engineering and plant construction
- Suitable for gaseous or liquid media that will not obstruct the pressure system

## Special features

- Vibration and shock resistant (with liquid filling)
- All stainless steel construction
- Pressure ranges up to 15,000 psi


**Bourdon Tube Pressure Gauge Model 232.54**

## Standard Features

**Design**
ASME B40.100 & EN 837-1

**Sizes**
2½" & 4" (63 & 100 mm)

**Accuracy class**
2½": ± 2/1/2% of span (ASME B40.100 Grade A)
4": ± 1% of span (ASME B40.100 Grade 1A)

**Ranges**
Vacuum / Compound to 200 psi
Pressure from 15 psi to 15,000 psi
or other equivalent units of pressure or vacuum

**Working pressure**

| | | |
|---|---|---|
| 2½": | Steady: | 3/4 scale value |
| | Fluctuating: | 2/3 full scale value |
| | Short time: | full scale value |
| 4": | Steady: | full scale value |
| | Fluctuating: | 0.9 x full scale value |
| | Short time: | 1.3 x full scale value |

**Operating temperature**
Ambient: -40°F to +140°F (-40°C to +60°C) - dry
-4°F to +140°F (-20°C to +60°C) - glycerine filled
-40°F to +140°F (-40°C to +60°C) - silicone filled
Medium: +212°F (+100°C) maximum

**Temperature error**
Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% for every 18°F (10°C) rising or falling. Percentage of span.

**Weather protection**
Weather tight (NEMA 4X / IP 65)

**Pressure connection**
Material: 316L stainless steel
Lower mount (LM) or center back mount (CBM) - 2½"
Lower mount (LM) or lower back mount (LBM) - 4"
1/4" NPT or 1/2" NPT limited to wrench flat area

**Bourdon tube**
Material: 316L stainless steel
2" & 2½": ≤ 1,000 PSI: C-type,
≥ 1,500 PSI: helical type
4": ≤ 1,500 PSI: C-type,
≥ 2,000 PSI: helical type

**Movement**
300-series stainless steel

**Dial**
White aluminum with black lettering; 2½" size with stop pin

**Pointer**
Black aluminum, friction adjustable

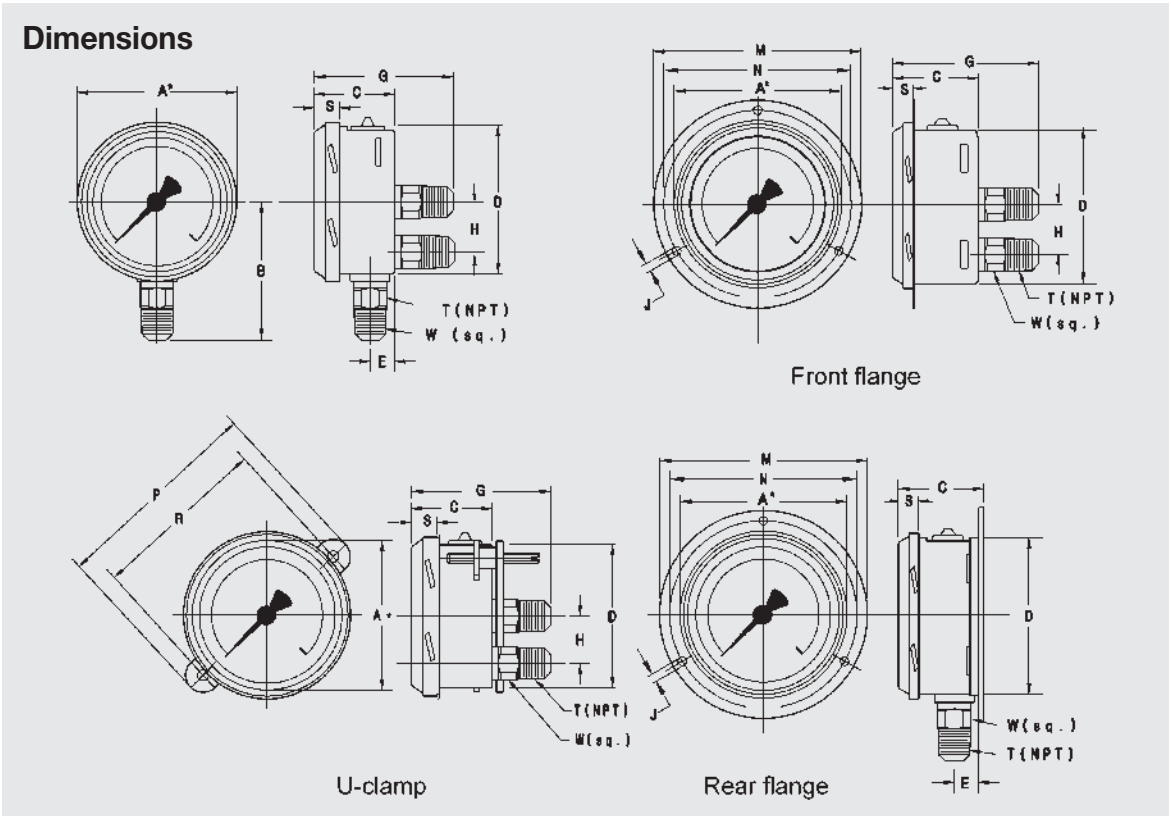
**Case**
304 stainless steel with vent plug and polished stainless steel bayonet ring. Suitable for liquid filling. Welded case/ socket connection

**Window**
Laminated safety glass with Buna-N gasket

**Case fill**
Glycerine 99.7% - Type 233.54

**Optional extras**
- 316SS restrictor
- Accuracy ±1.0% of full scale (2½" size)
- Stainless steel front or rear flange
- Zinc-plated steel or SS u-clamp bracket (field installable)
- Red drag pointer or mark pointer
- Silicone or fluorolube case filling
- Special connections limited to wrench flat area
- Custom dial layout
- Other pressure scales available
  bar, kPa, MPa, kg/cm² and dual scales

## Dimensions




| Size | | A | B | C | D | E | G | H | J | M | N | P | R | S | T | W | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.5" | mm | 70 | 54 | 33.5 | 62 | 13 | 55.5 | - | 3.6 | 85 | 75 | 87 | 72 | 12 | | 14 | 0.36 lb. | dry |
| | in | 2.75 | 2.13 | 1.32 | 2.44 | 0.51 | 2.19 | - | 0.14 | 3.35 | 2.95 | 3.43 | 2.83 | 0.47 | 1/4" | 0.55 | 0.44 lb. | filled |
| 4" | mm | 110 | 87 | 49.5 | 100 | 15.5 | 81 | 30 | 4.8 | 132 | 116 | 125 | 110 | 15 | | 22 | 1.10 lb. | dry |
| | in | 4.30 | 3.43 | 1.95 | 3.94 | 0.61 | 3.19 | 1.18 | 0.19 | 5.20 | 4.57 | 4.92 | 4.33 | 0.59 | 1/2" | 0.87 | 1.76 lb. | filled |

**Recommended panel cutout is dimension D + 1 mm**



**Ordering information**
Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

**WIKA Instrument Corporation**
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Lawrenceville, GA 30045
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Fax (770) 338-5118
E-Mail info@wika.com
www.wika.com

# APPENDIX O

## Sample Electrical Drawings and Single Line Diagram

## (Envelope 1)

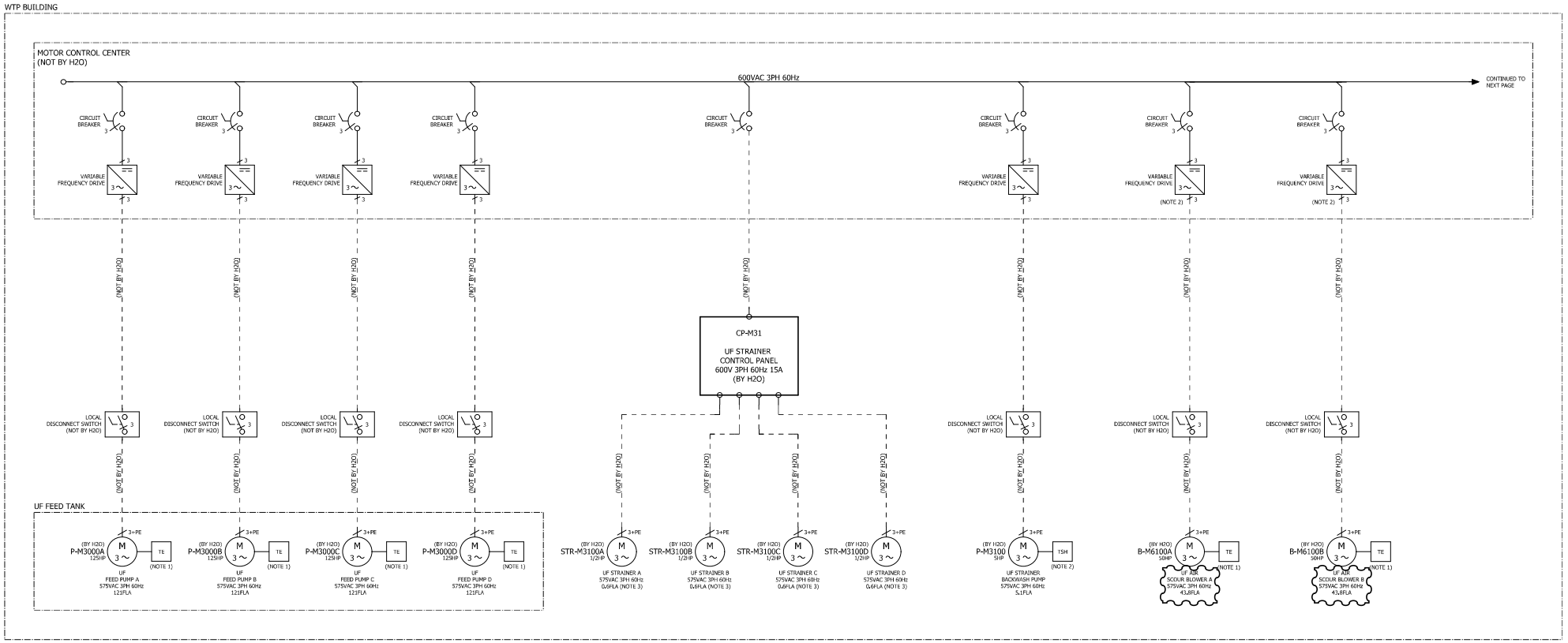
The Drawing provided is an example of H2O Innovation Standards and Details regarding Electrical Single line Diagrams



# TABLE OF CONTENTS



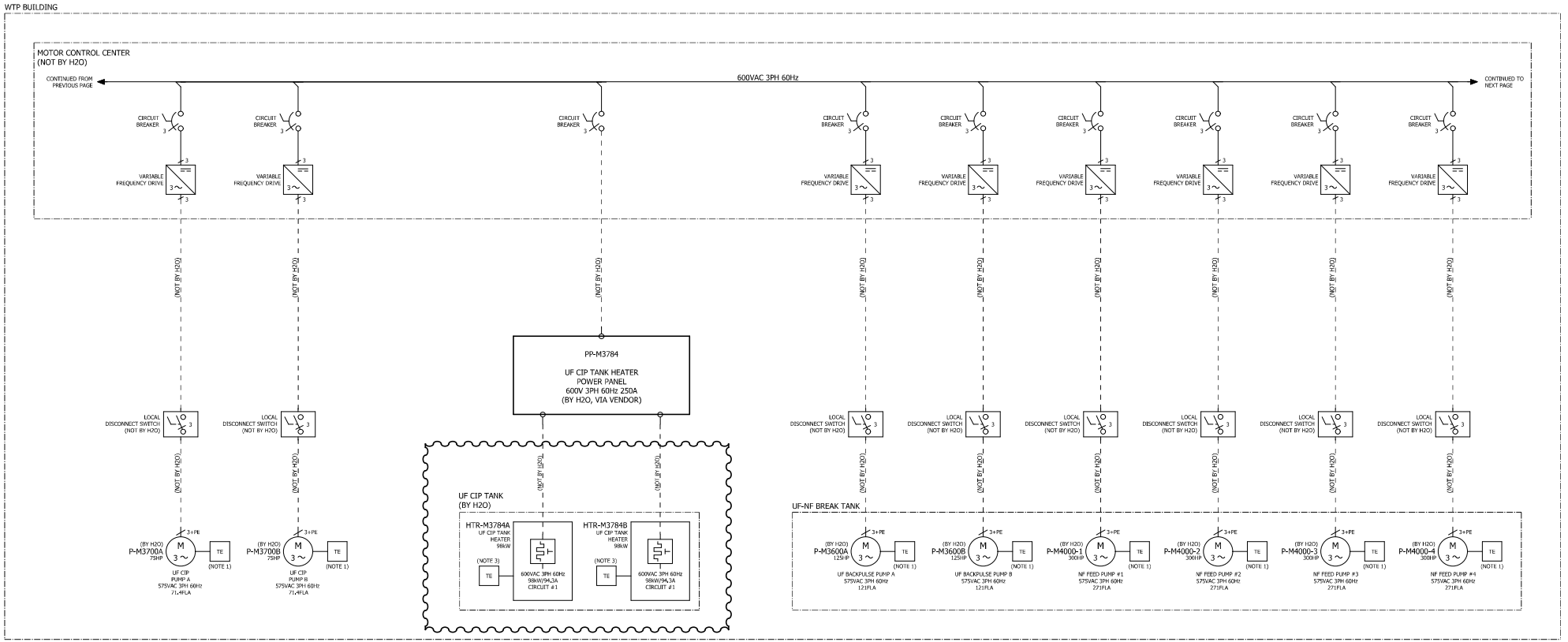
| REV | DATE | DESCRIPTION | DRAWN BY | VERIFIED BY |
|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A |




NOTES:

1. BUILT-IN MOTOR THERMISTOR TO BE WIRED TO VFD'S TERMINALS. MOTOR WILL STOP IN CASE OF HIGH TEMPERATURE
2. BUILT-IN MOTOR TEMPERATURE SWITCHES TO BE WIRED TO VFD'S TERMINALS. MOTOR WILL STOP IN CASE OF HIGH TEMPERATURE
3. MOTOR FLA VALUE NOT AVAILABLE FROM SUPPLIER YET. ESTIMATED FLA VALUE FOR NOW.

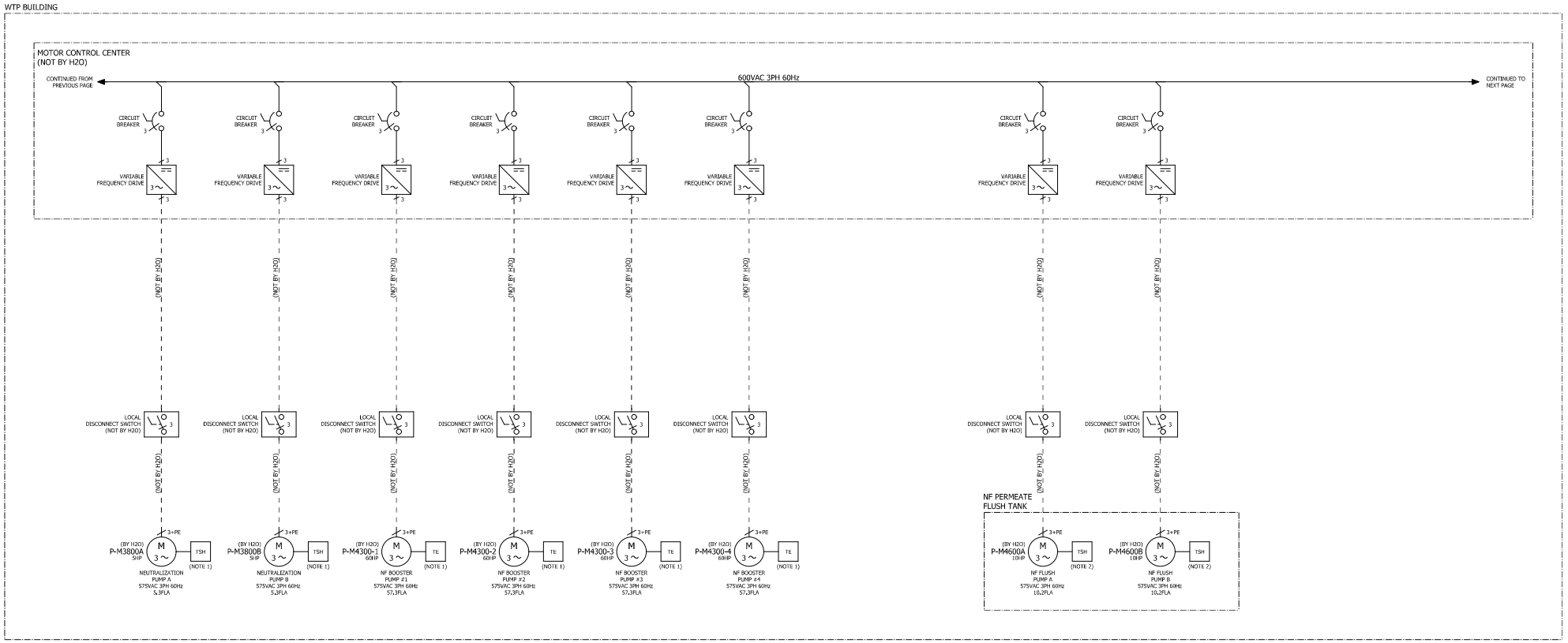
| REV | DATE | DESCRIPTION | DRAWN BY | VERIFIED BY |
|---|---|---|---|---|
| 01 | 04/12/2020 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05 | P.L.D. | E.R. |
| 02 | 01/03/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05_01 | L.M. | E.R. |
| 03 | 07/05/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05_02 | L.M. | E.R. |
| 04 | 02/07/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP2_SD-24 | L.M. | E.R. |
| 05 | 18/08/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP2_SD-24_01 | L.M. | E.R. |
| 06 | 13/12/2021 | ISSUED FOR CONSTRUCTION | L.M. | E.R. |




NOTES:

1. BUILT-IN MOTOR THERMISTOR TO BE WIRED TO VFD'S TERMINALS. MOTOR WILL STOP IN CASE OF HIGH TEMPERATURE
2. VARIABLE FREQUENCY DRIVES MUST BE SET IN CONSTANT TORQUE MODE
3. TANK HEATER TEMPERATURE SENSORS TO BE WIRED TO THE HEATER POWER PANEL

| REV | DATE | DESCRIPTION | DRAWN BY | VERIFIED BY |
|---|---|---|---|---|
| 01 | 04/12/2020 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05 | P.L.D. | E.R. |
| 02 | 01/03/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05_01 | L.M. | E.R. |
| 03 | 07/05/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05_02 | L.M. | E.R. |
| 04 | 02/07/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP2_SD-24 | L.M. | E.R. |
| 05 | 18/08/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP2_SD-24_01 | L.M. | E.R. |
| 06 | 13/12/2021 | ISSUED FOR CONSTRUCTION | L.M. | E.R. |




NOTE:

1. BUILT-IN MOTOR THERMISTOR TO BE WIRED TO VFD'S TERMINALS. MOTOR WILL STOP IN CASE OF HIGH TEMPERATURE

| REV | DATE | DESCRIPTION | DRAWN BY | VERIFIED BY |
|---|---|---|---|---|
| 01 | 04/12/2020 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05 | P.L.D. | E.R. |
| 02 | 01/03/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP1_SD-05_01 | L.M. | E.R. |
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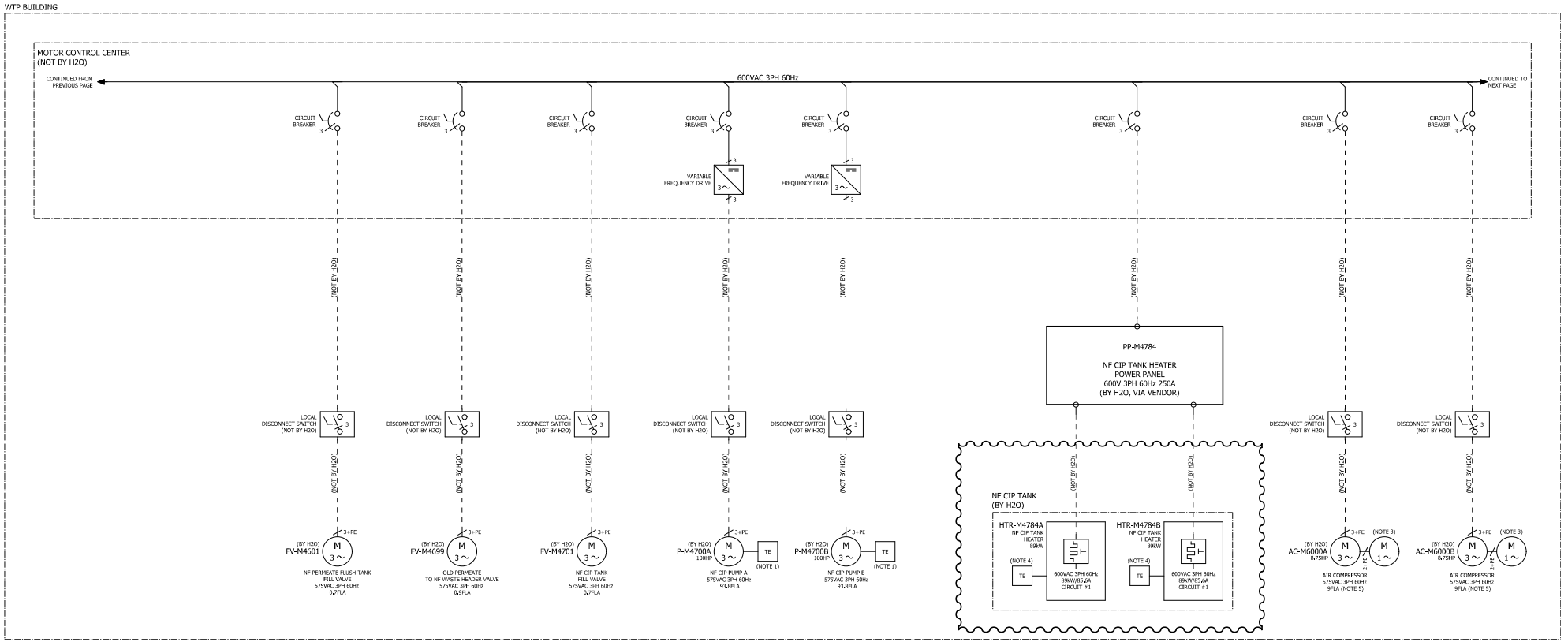
| 04 | 02/07/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP2_SD-24 | L.M. | E.R. |
| 05 | 18/08/2021 | REVISED AS PER SUBMITTAL REVIEW COMMENTS #DP2_SD-24_01 | L.M. | E.R. |
| 06 | 13/12/2021 | ISSUED FOR CONSTRUCTION | L.M. | E.R. |




NOTES:

1. BUILT-IN MOTOR THERMISTOR TO BE WIRED TO VFD'S TERMINALS. MOTOR WILL STOP IN CASE OF HIGH TEMPERATURE
2. BUILT-IN MOTOR TEMPERATURE SWITCHES TO BE WIRED TO VFD'S TERMINALS. MOTOR WILL STOP IN CASE OF HIGH TEMPERATURE
3. BUILT-IN REFRIGERATED AIR DRYER
4. TANK HEATER TEMPERATURE SENSORS TO BE WIRED TO THE HEATER POWER PANEL
5. TOTAL PACKAGE INPUT POWER AT RATED CAPACITY AND FULL LOAD OPERATING PRESSURE. ESTIMATED MOTOR FLA VALUE

| REV | DATE | DESCRIPTION | DRAWN BY | VERIFIED BY |
|---|---|---|---|---|
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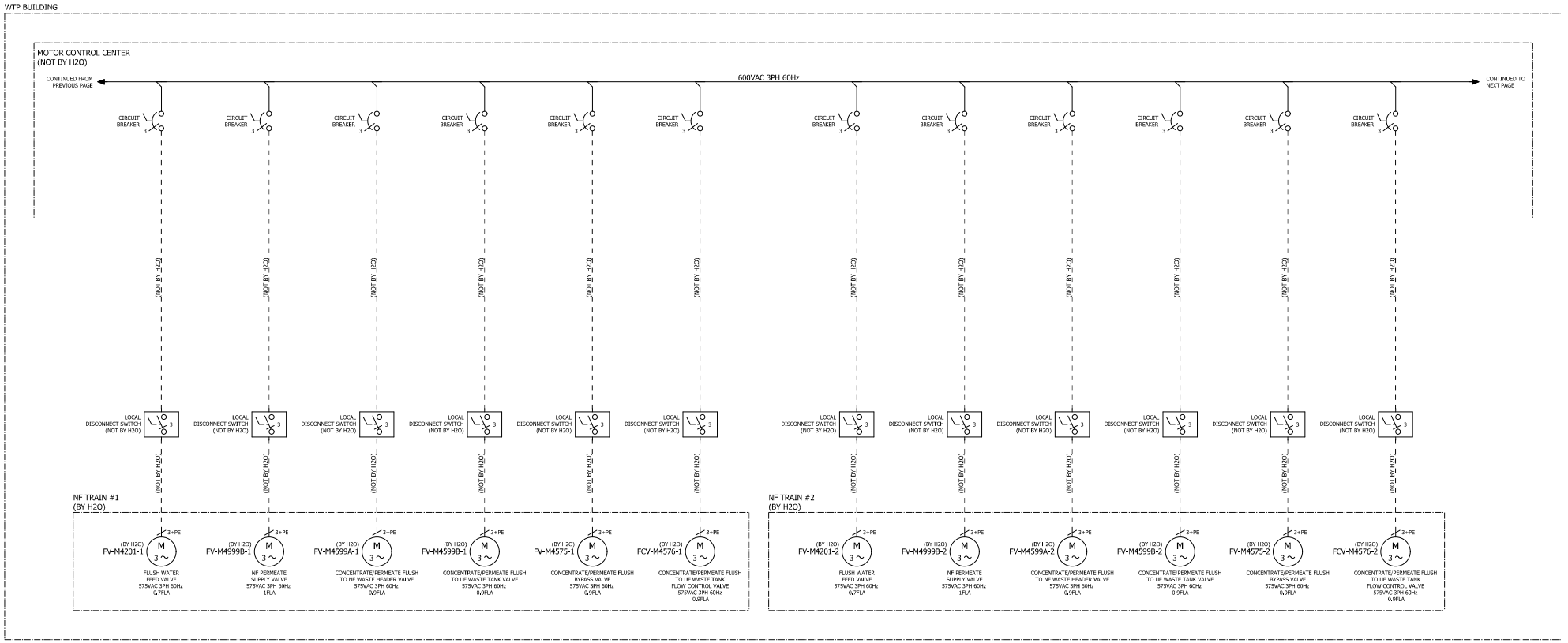


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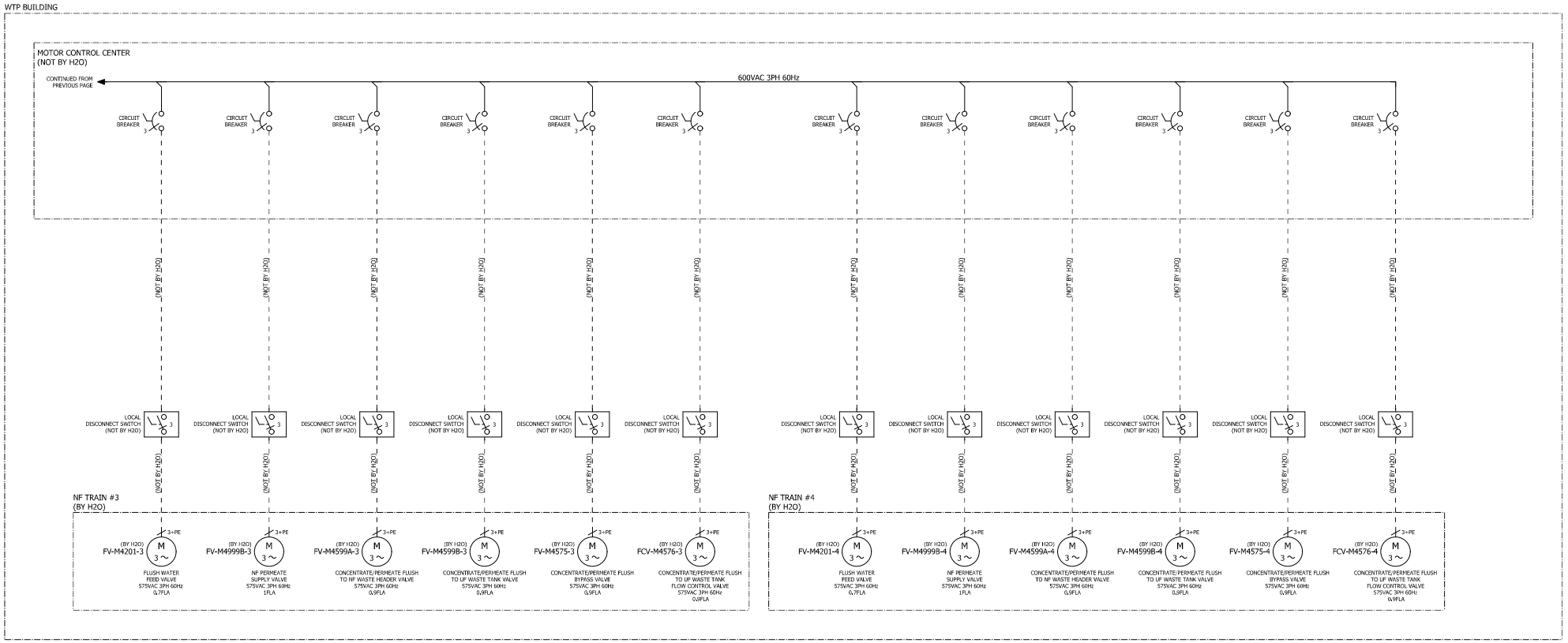


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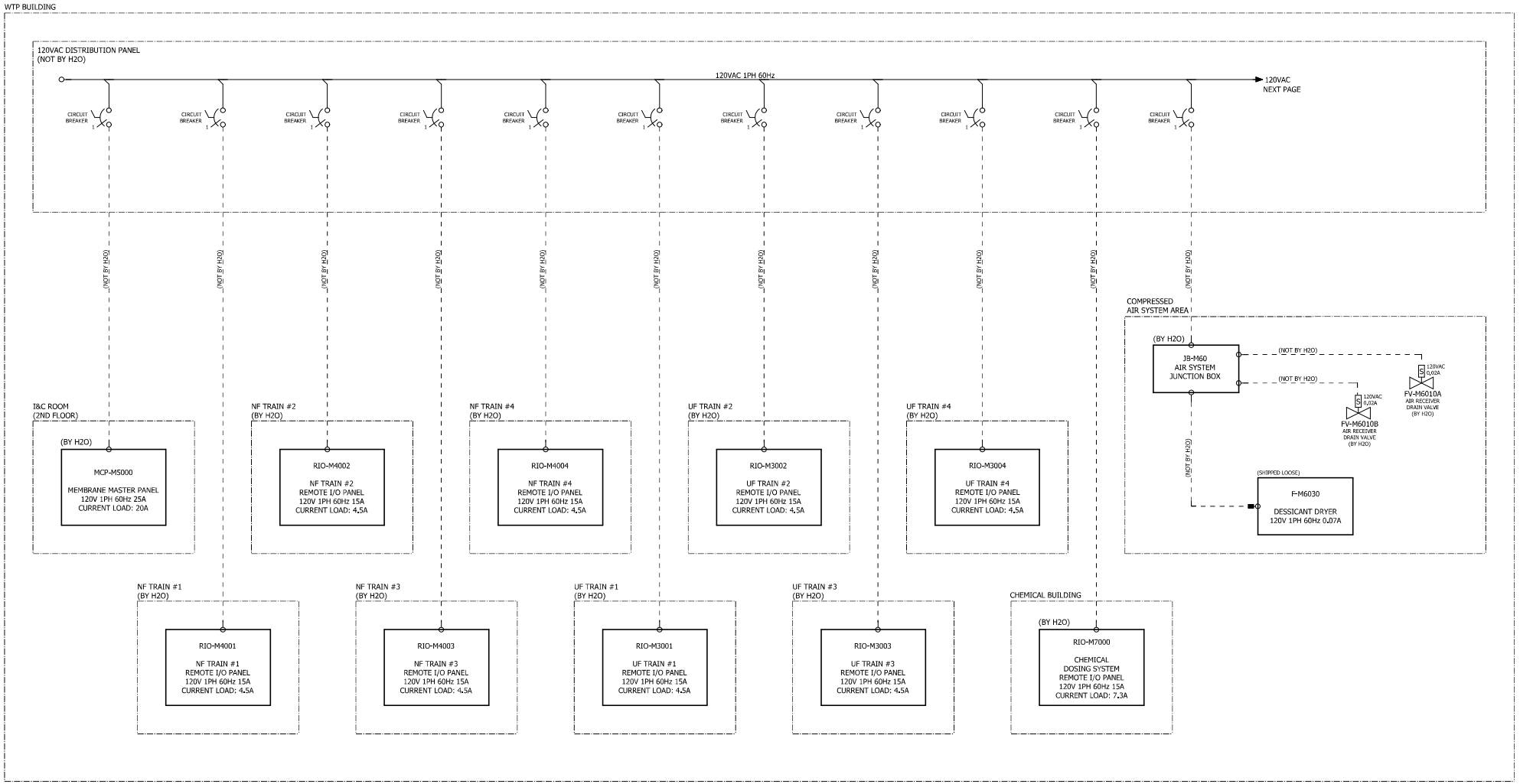


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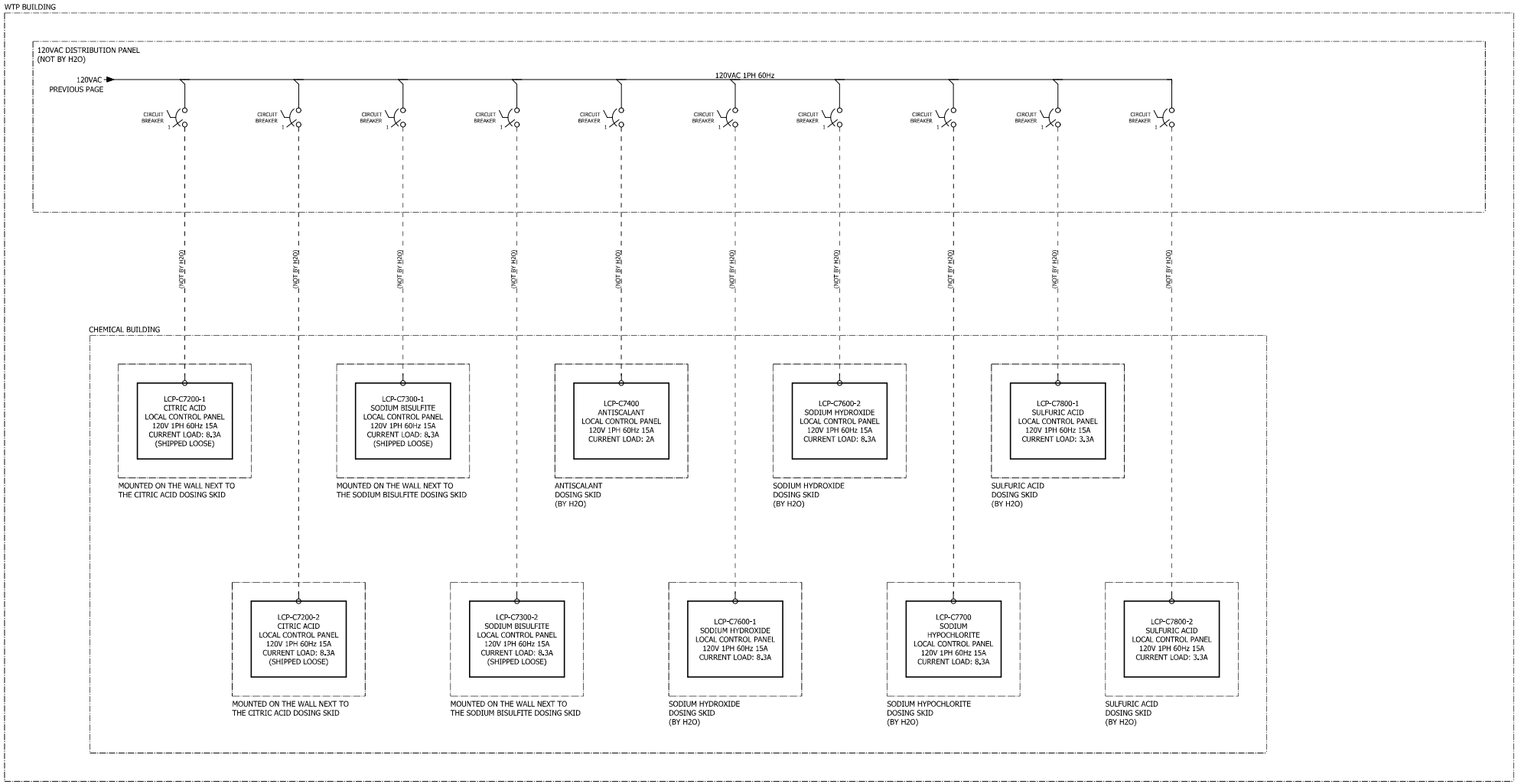


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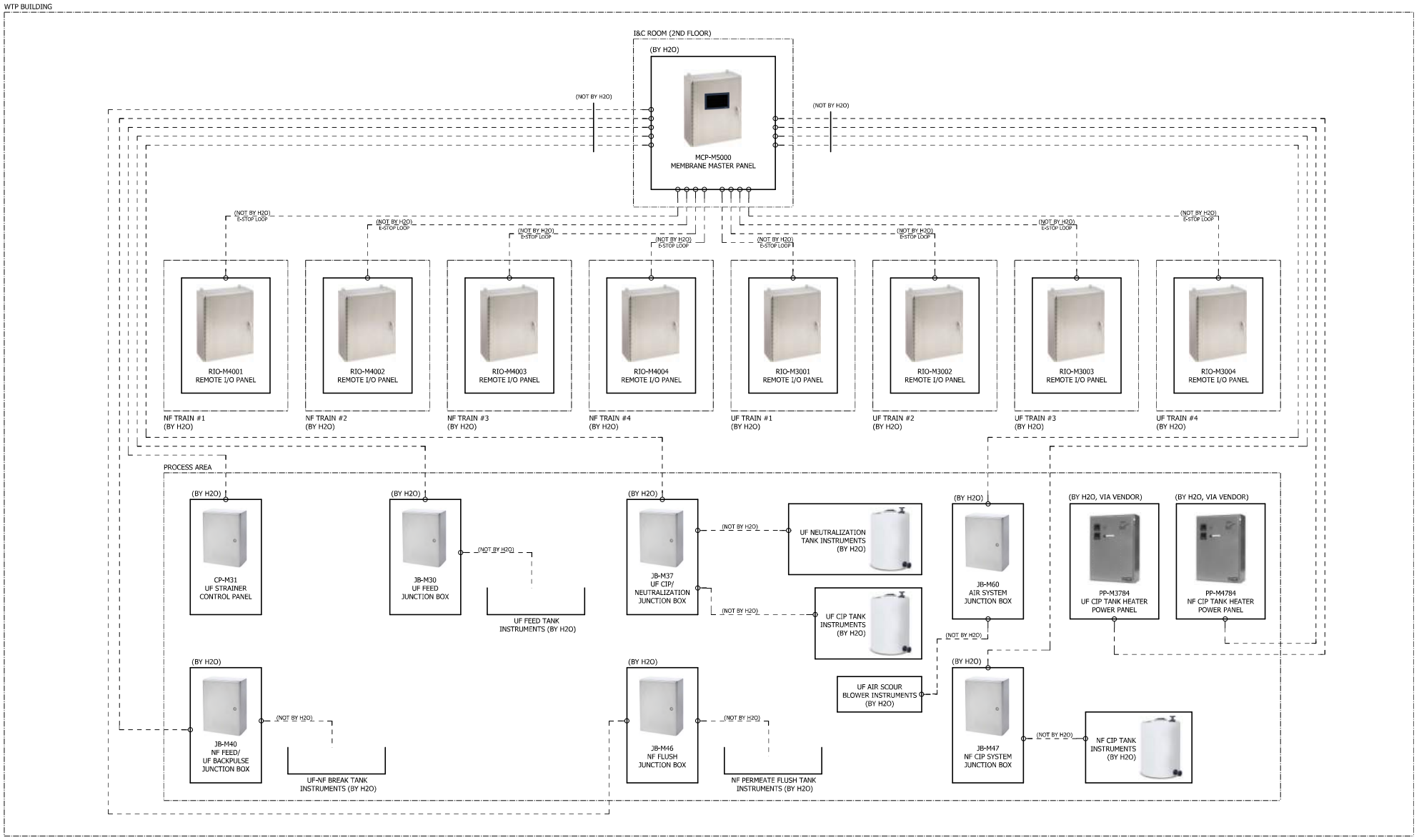


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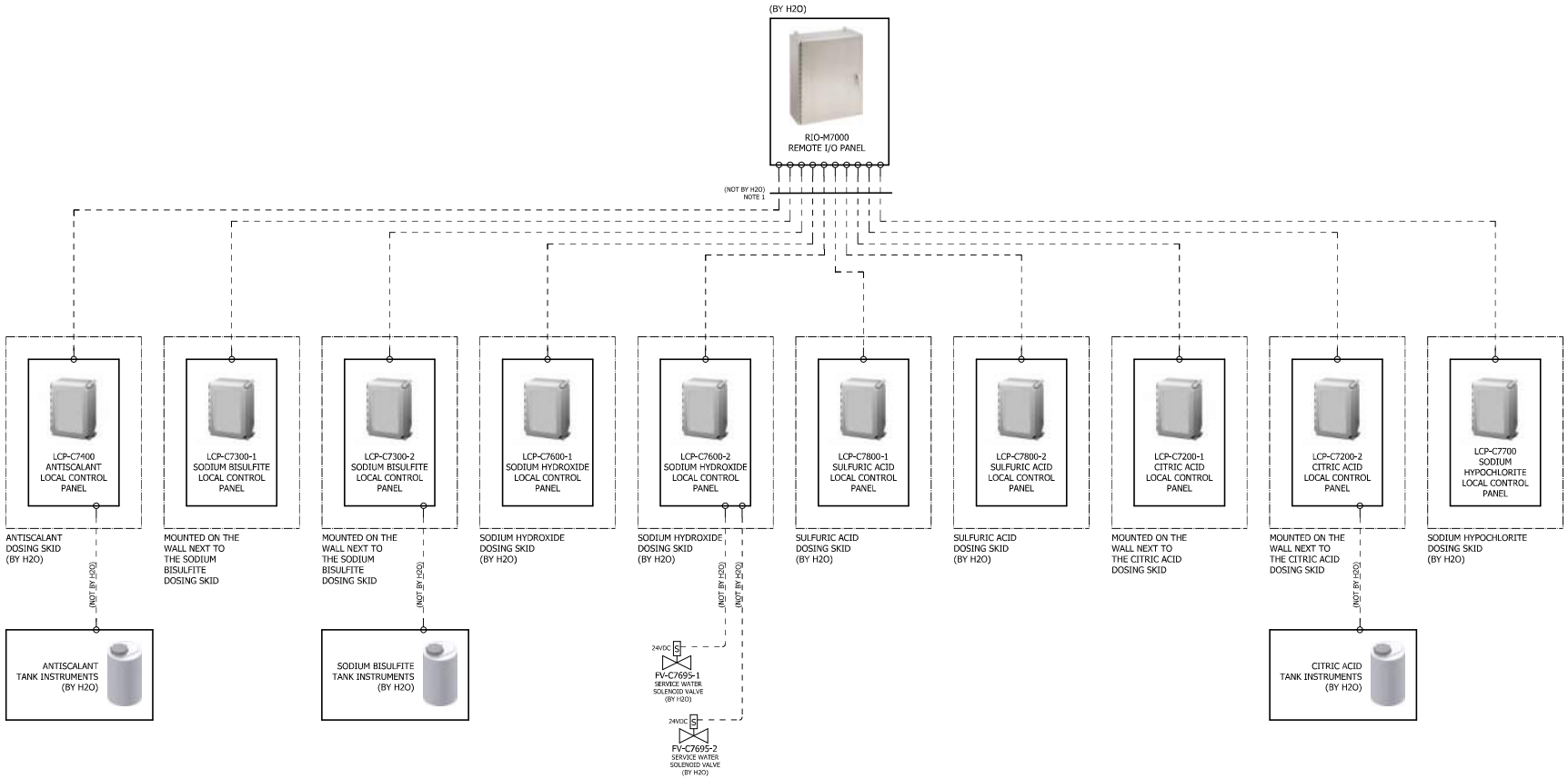
CHEMICAL BUILDING




NOTE:
1. CONTROL WIRING FOR I/O SIGNALS

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The Document provided is an example of H2O Innovation Standards and Details regarding Electrical Drawings



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# ELECTRICAL SCHEMATICS LEGEND

## CABLE/WIRE TYPE

CABLE - SHIELDED PAIR 600V FT-4, CSA/UL STRANDED COPPER, PVC INSULATION

WIRE - INTERNAL TO PANEL (BY H2O) - TEW 600V FT-1, CSA/UL STRANDED COPPER, PVC INSULATION

WIRE - EXTERNAL TO PANEL/SKID WIRING (BY H2O) - T90/TWN75/THHN THWN-2/MTW 600V FT-1, CSA/UL STRANDED COPPER, PVC INSULATION

WIRE - EXTERNAL TO PANEL/FIELD WIRING (NOT BY H2O)

## WIRE COLOR CODE

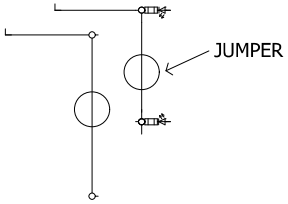
UTILITY POWER CIRCUITS
120VAC= BLACK
NEUTRAL= WHITE
GROUND= GREEN

DC CONTROL CIRCUITS
24VDC (+)= BLUE
24VDC (-)= BLUE/WHITE
AC DIGITAL INPUT= RED
AC DIGITAL OUTPUT=RED
INSTRUMENTATION= WHITE (+) / BLACK (-)

WIRE MARKERS:
WIRING WILL BE IDENTIFIED
AT BOTH ENDS WITH HEAT SHRINK TYPE

WIRE CONNECTIONS:
FERRULES WILL BE USED FOR CONNECTING
ALL WIRES TO SCREW-TYPE TERMINAL BLOCKS

## MISCELLANEOUS




EARTH GROUND

ISOLATED GROUND (INSTRUMENTATION)

## LOCATION BOX

LOCATION NAME

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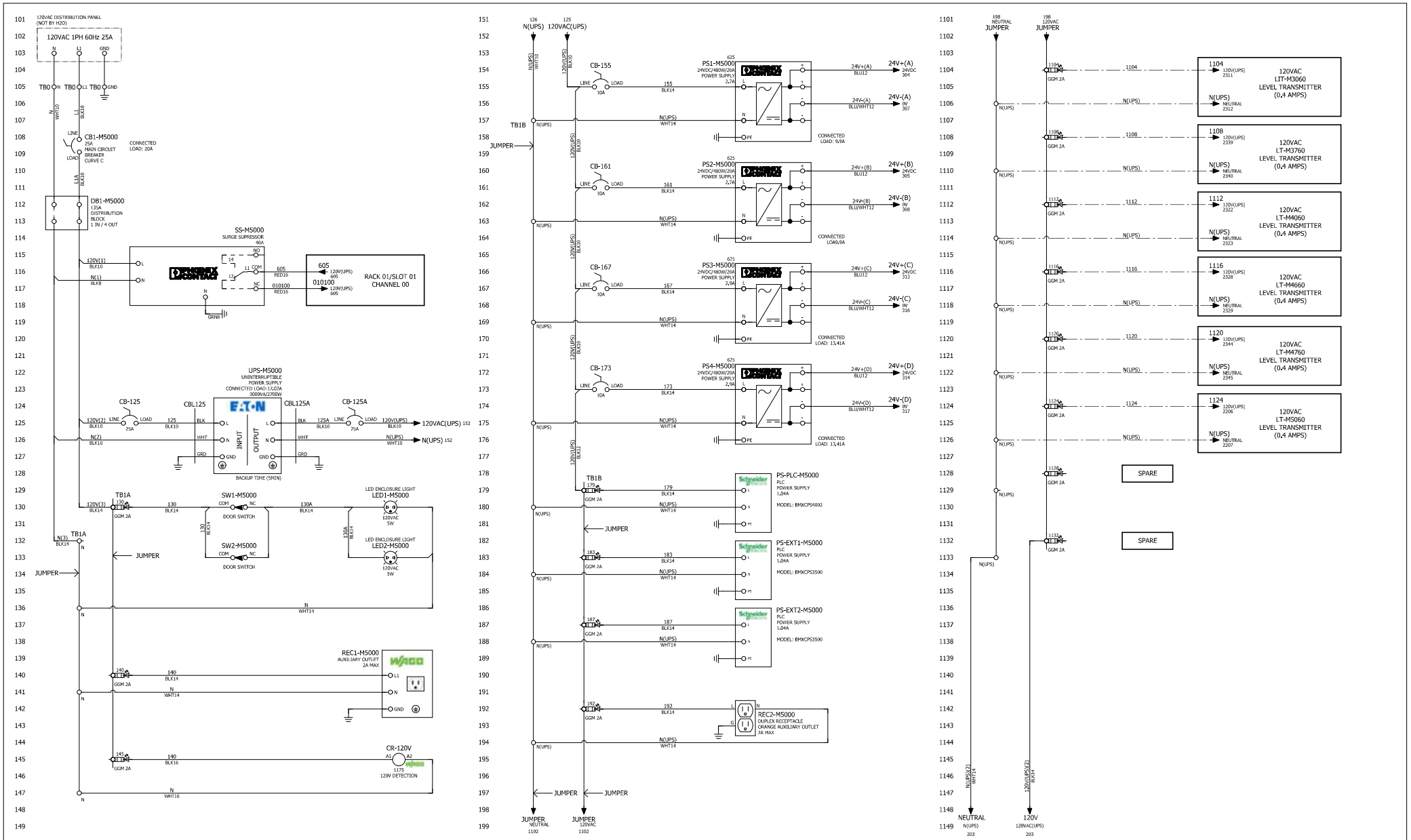


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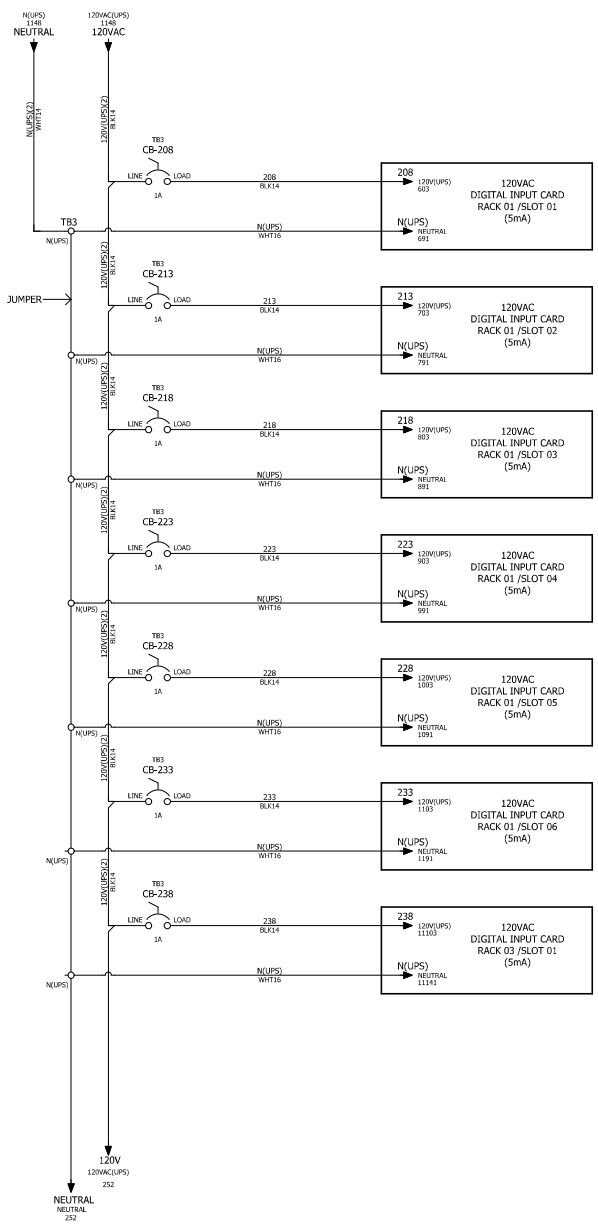


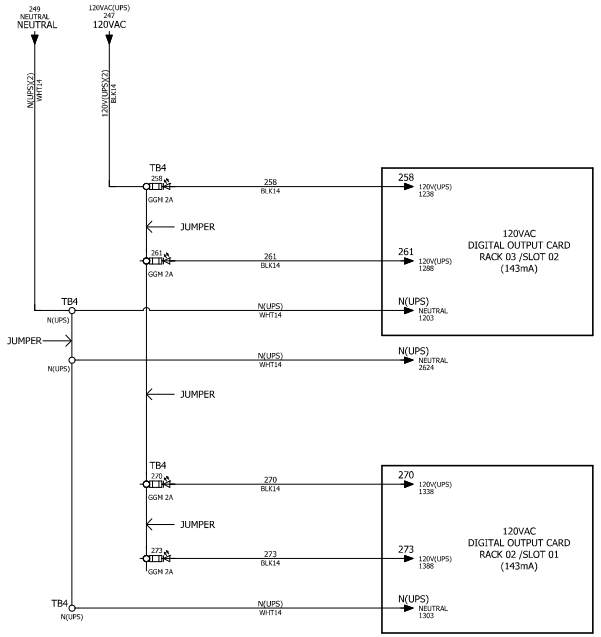


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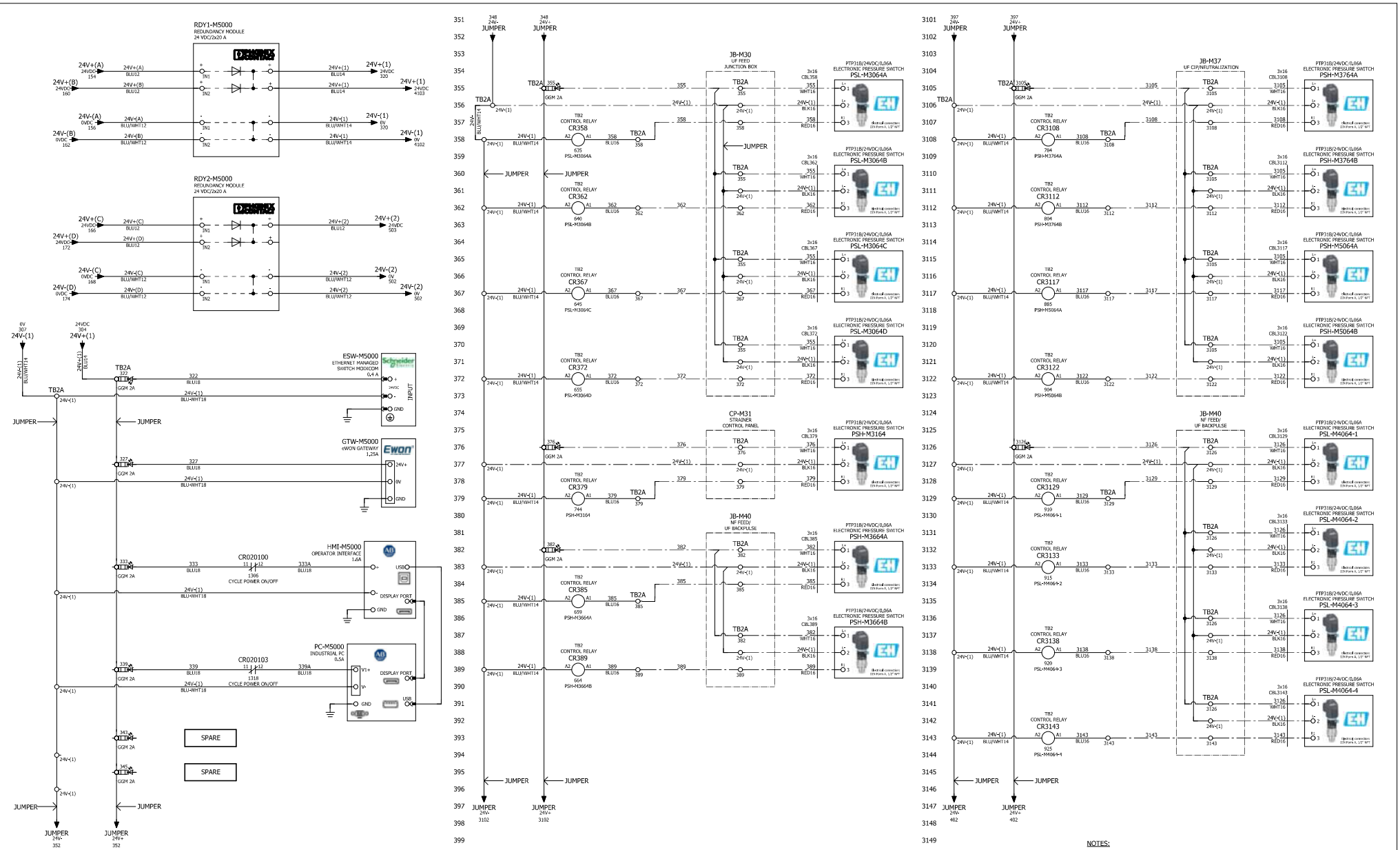


NOTES:

1. USE RING TERMINAL WITH 12AWG WIRE TO CONNECT TO THE EXTERNAL GROUNDING SCREW.

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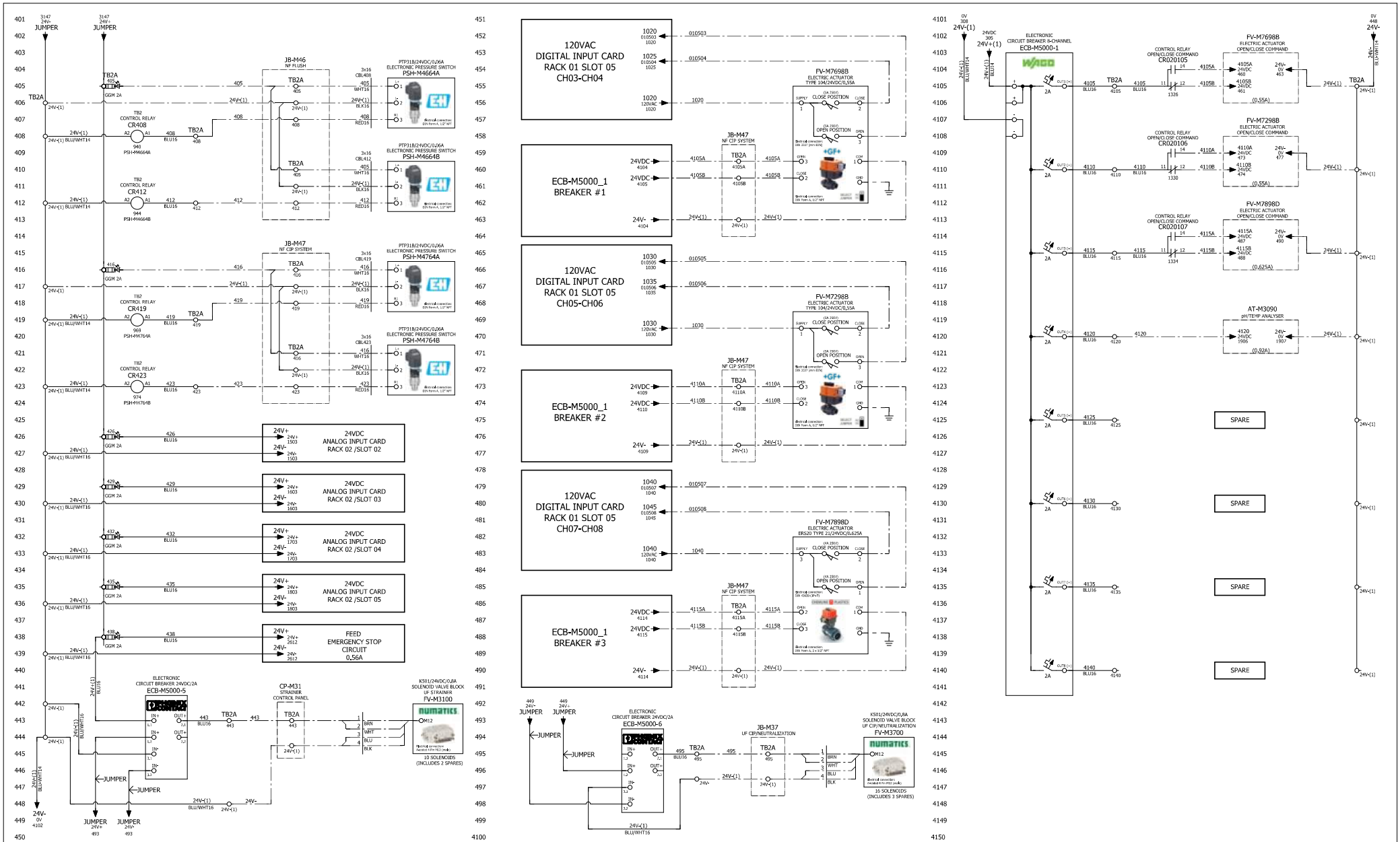


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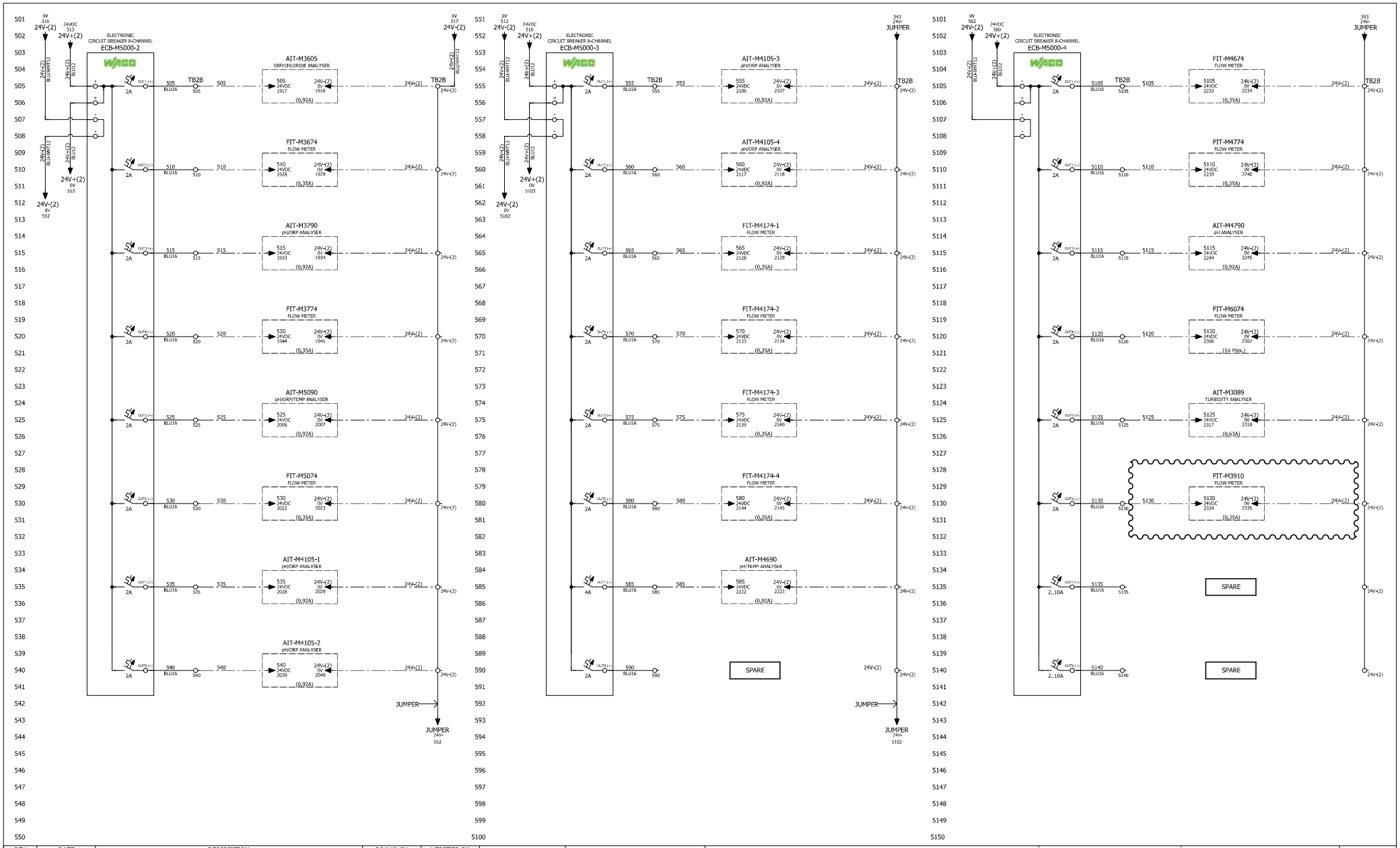


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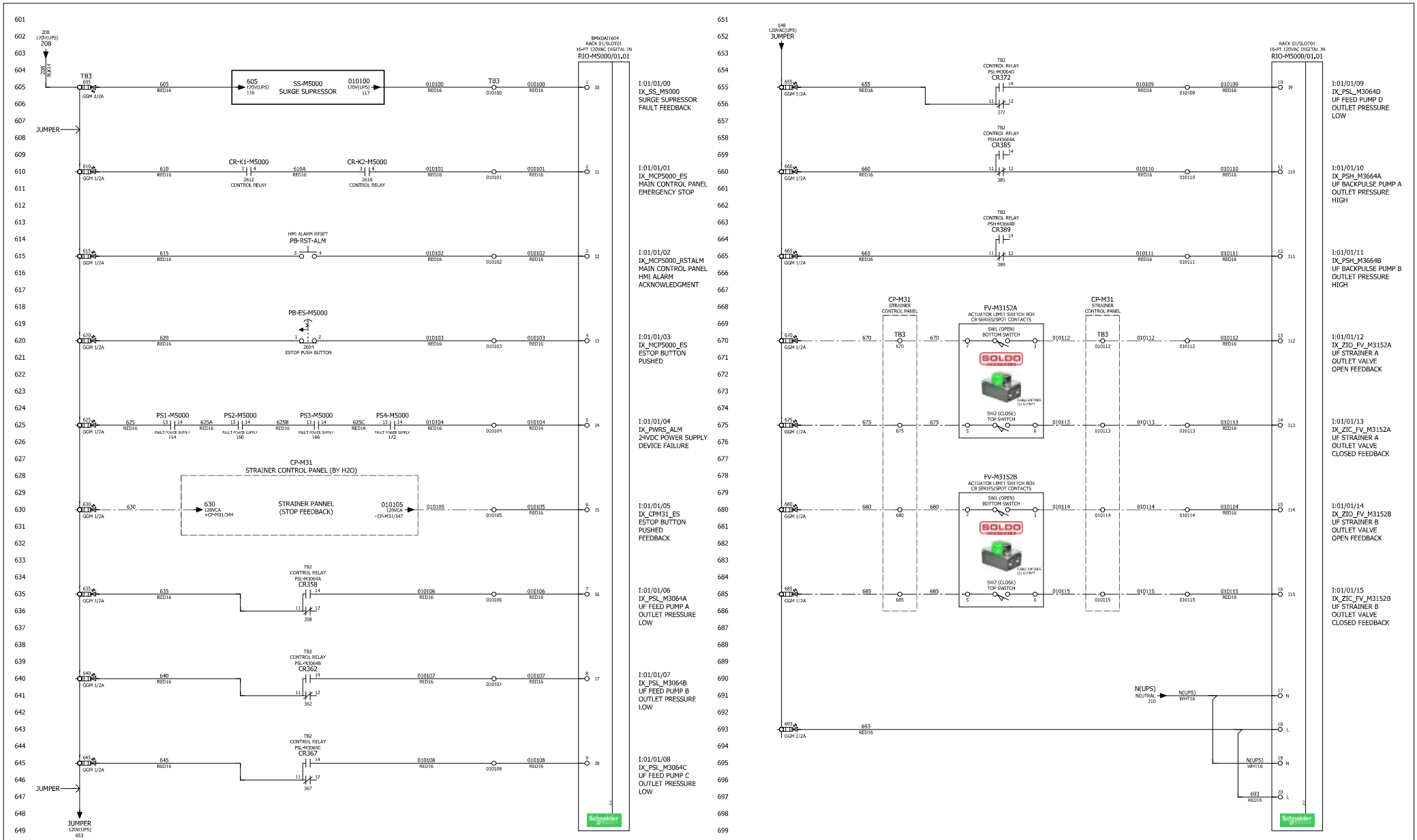


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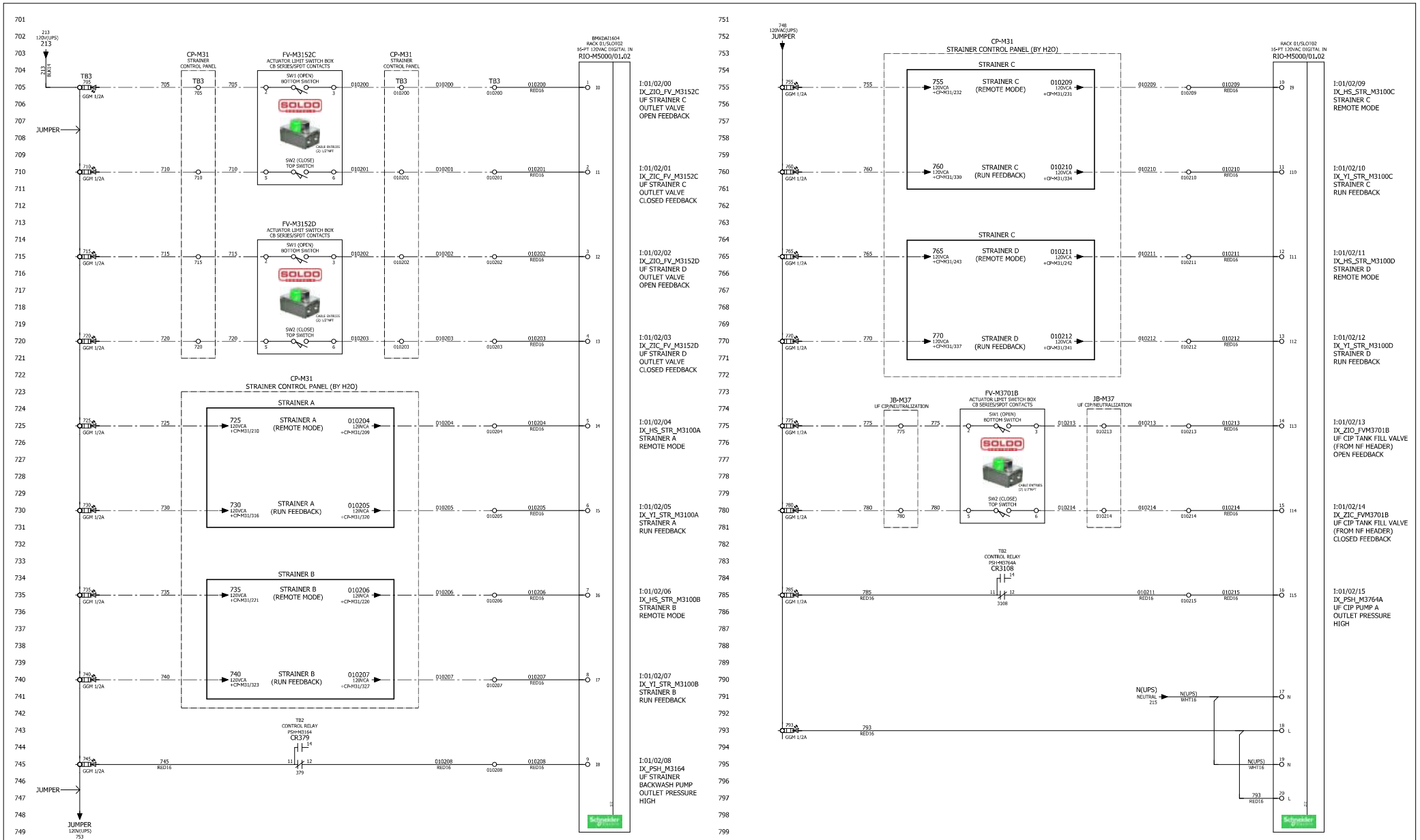


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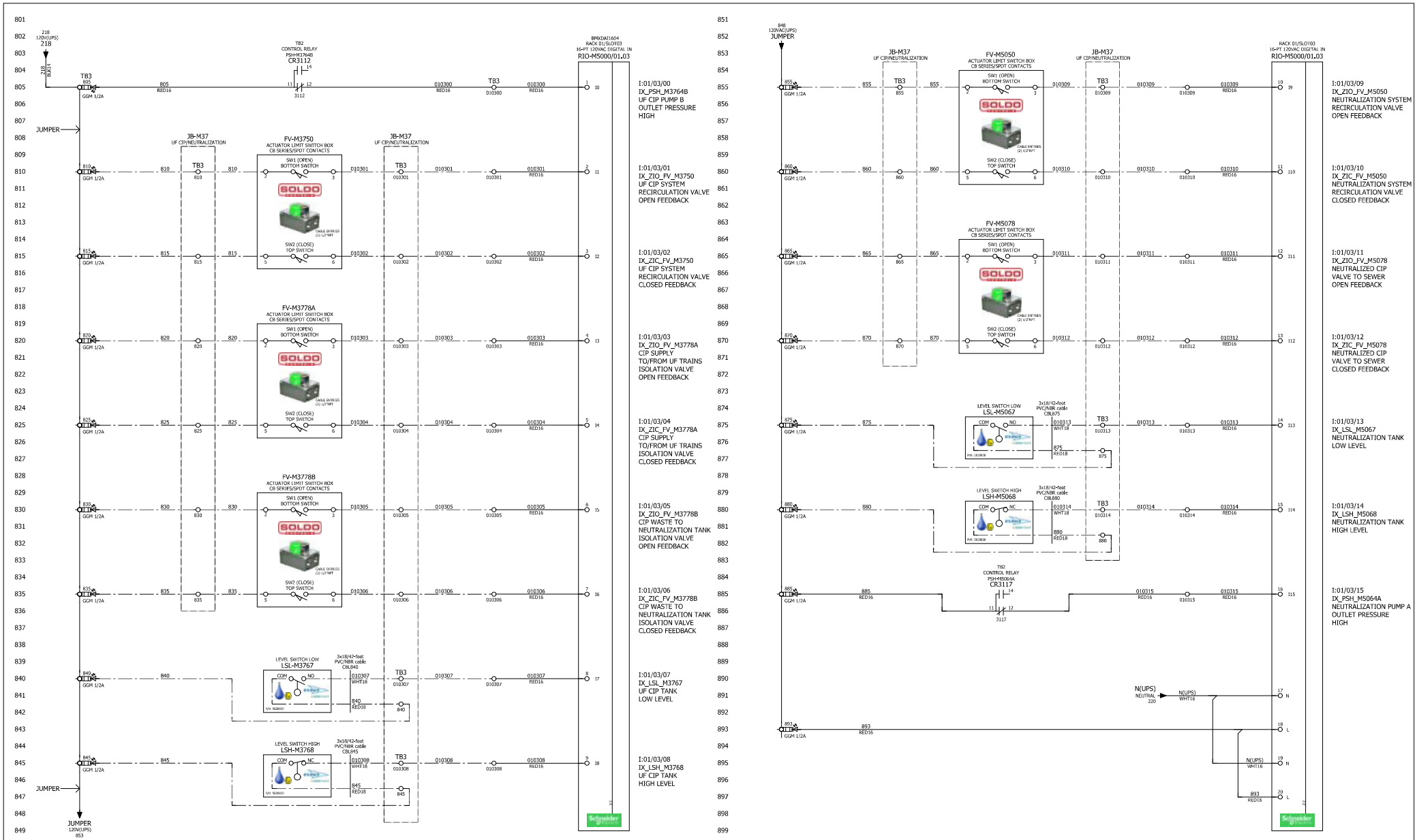


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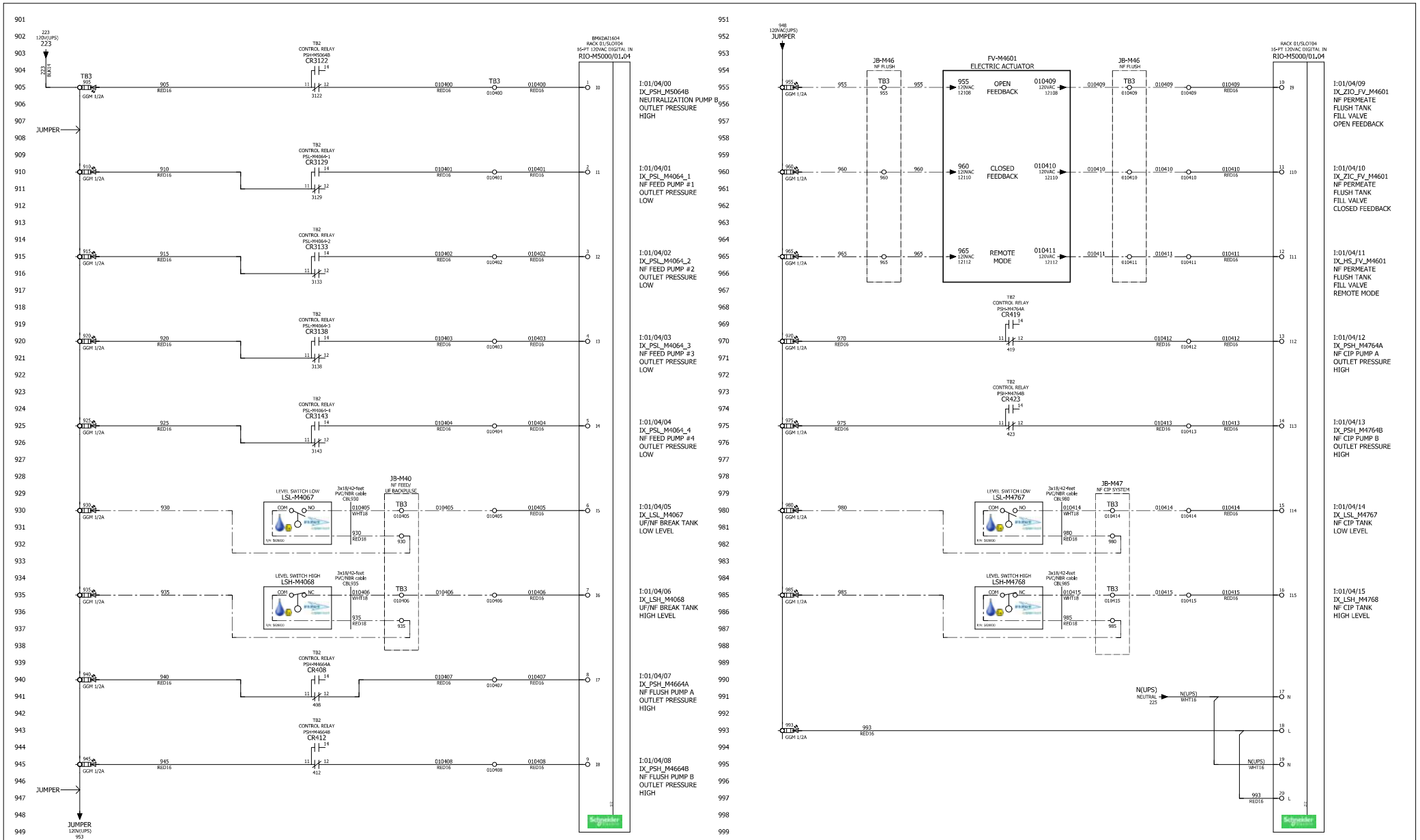


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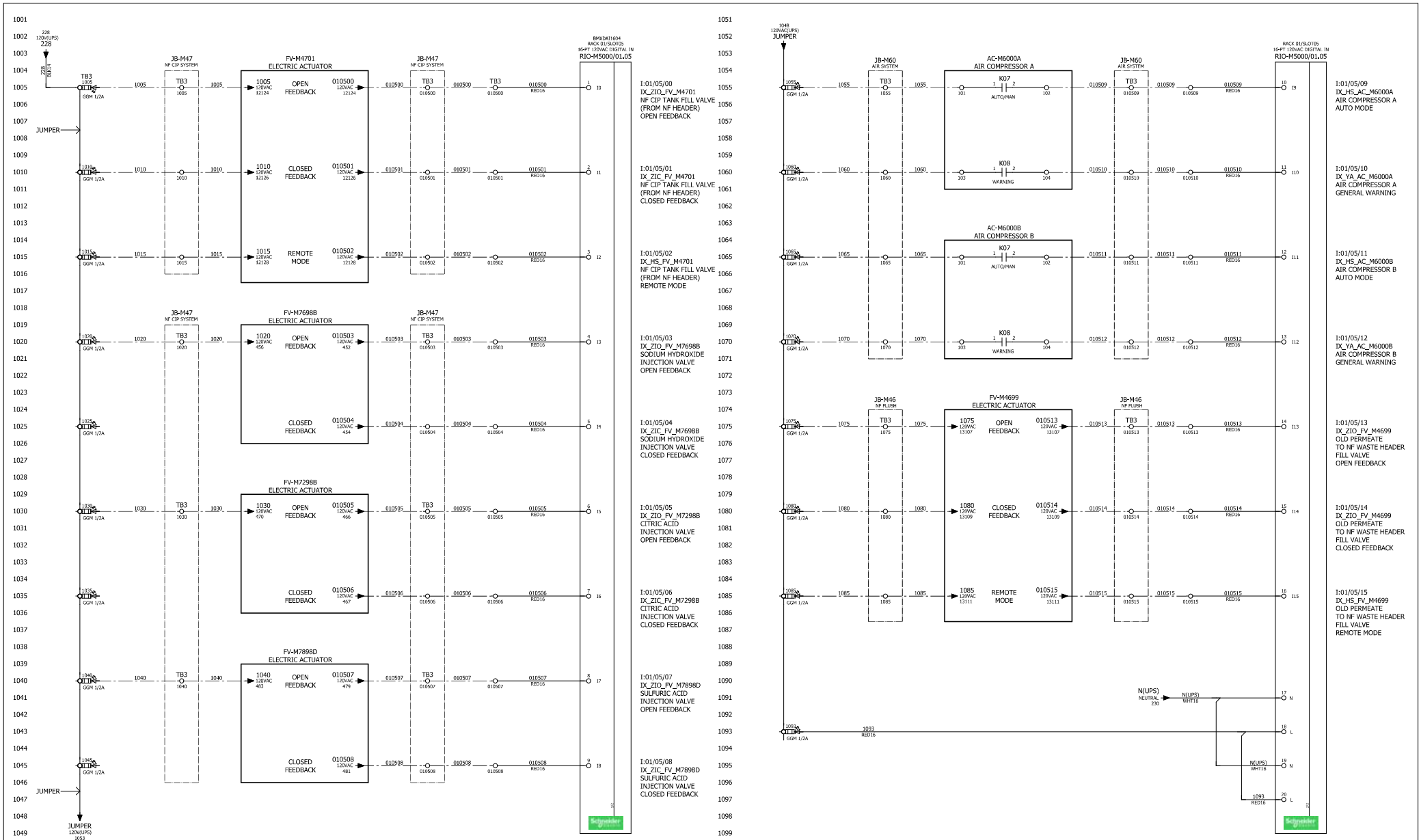


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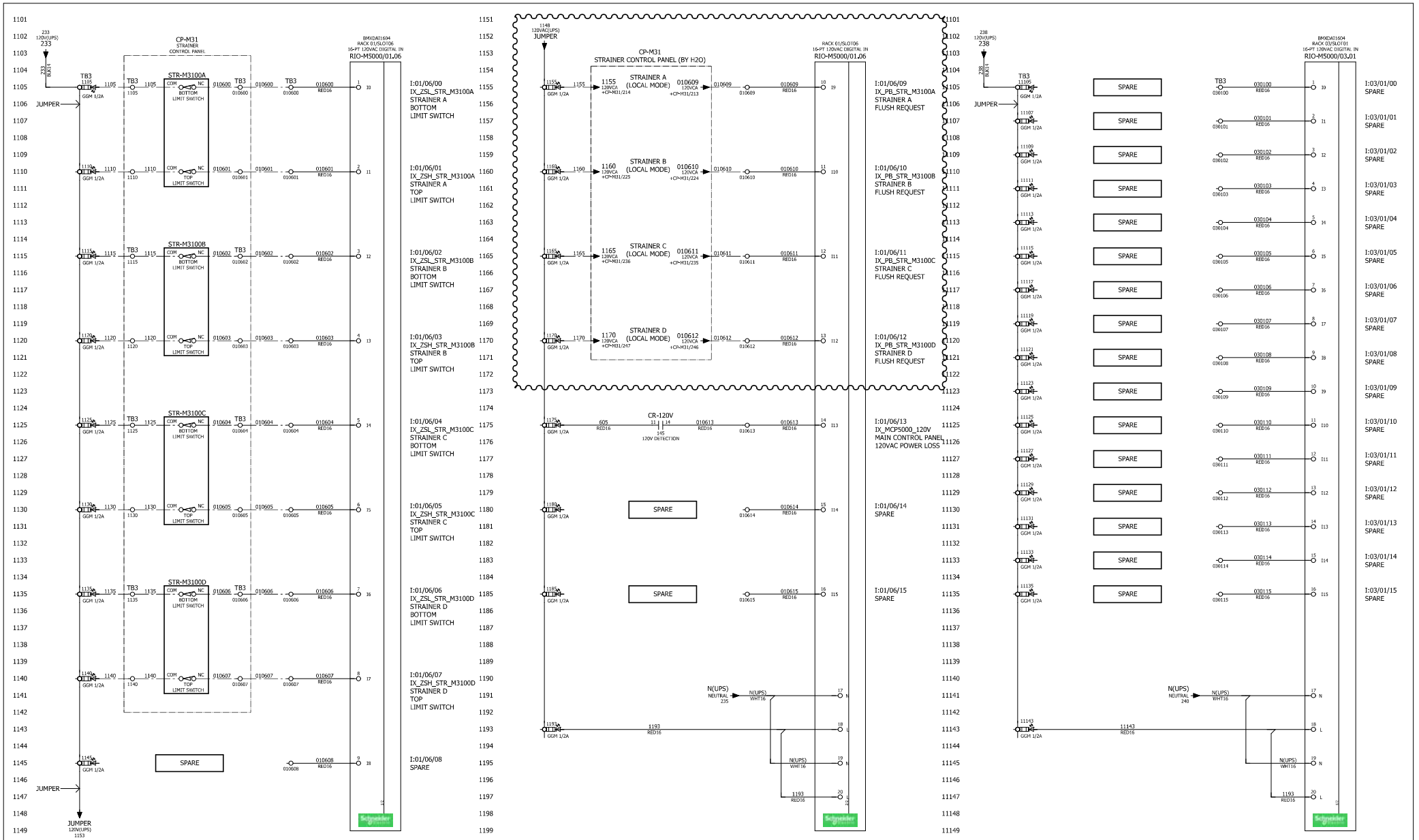


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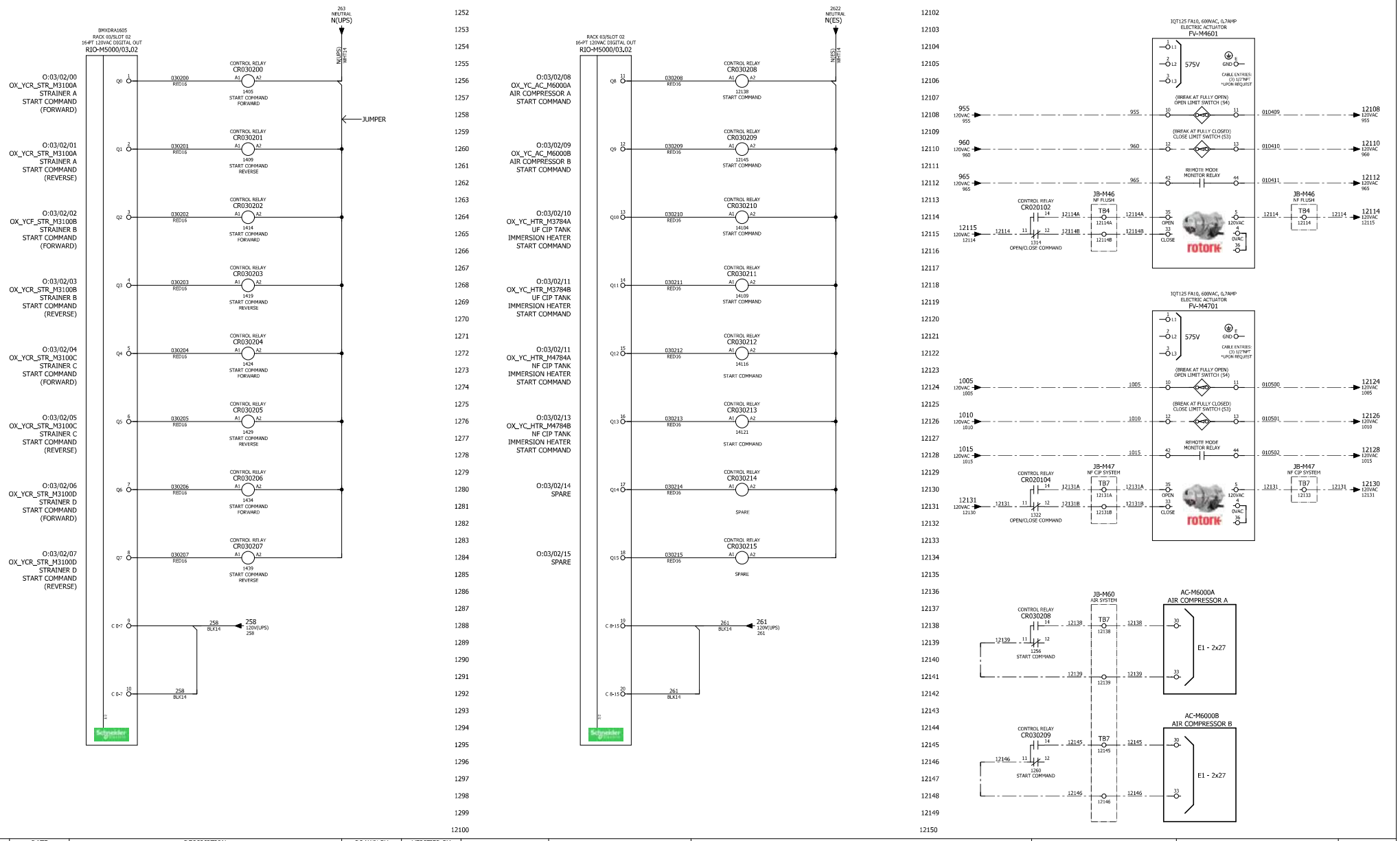


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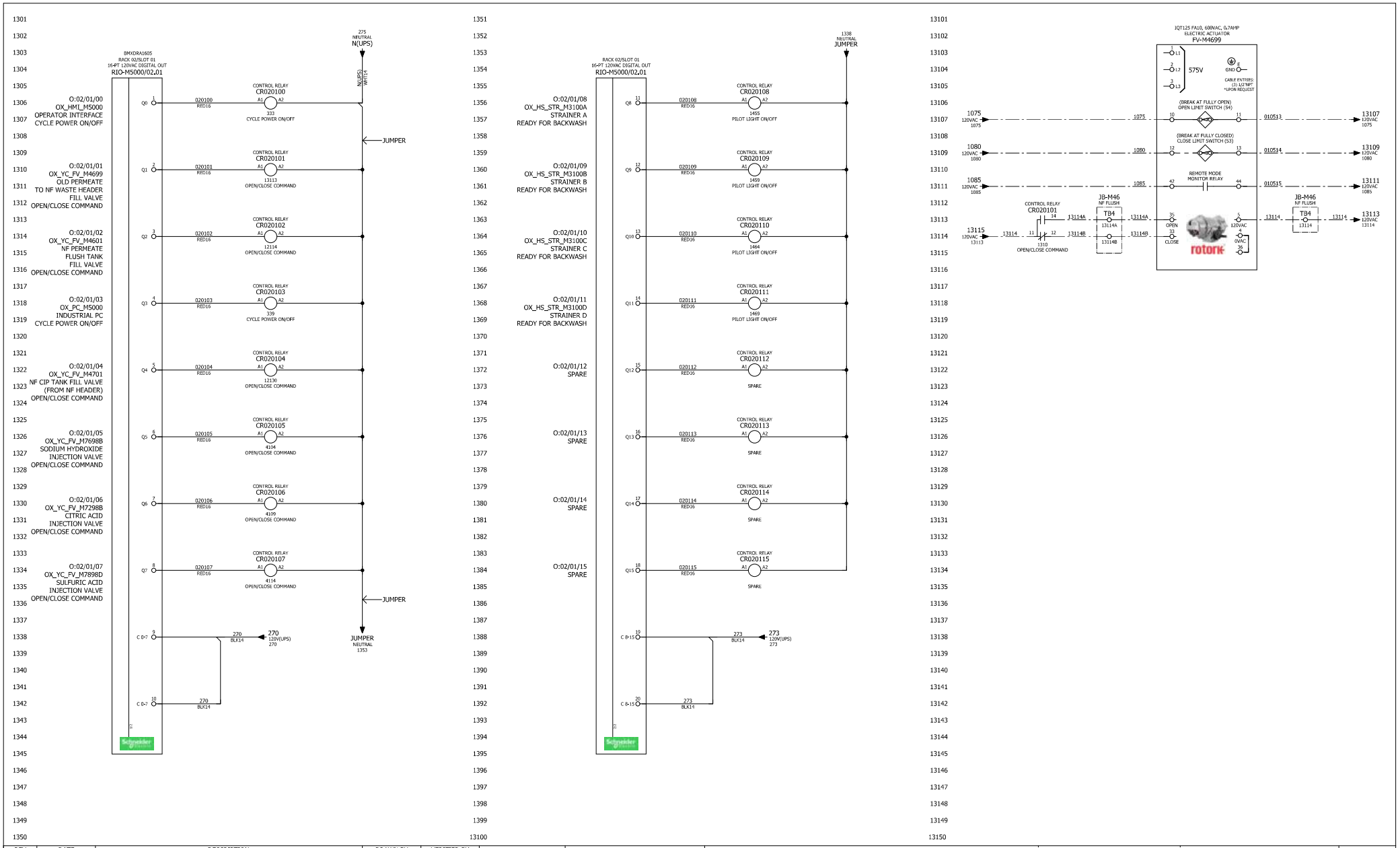


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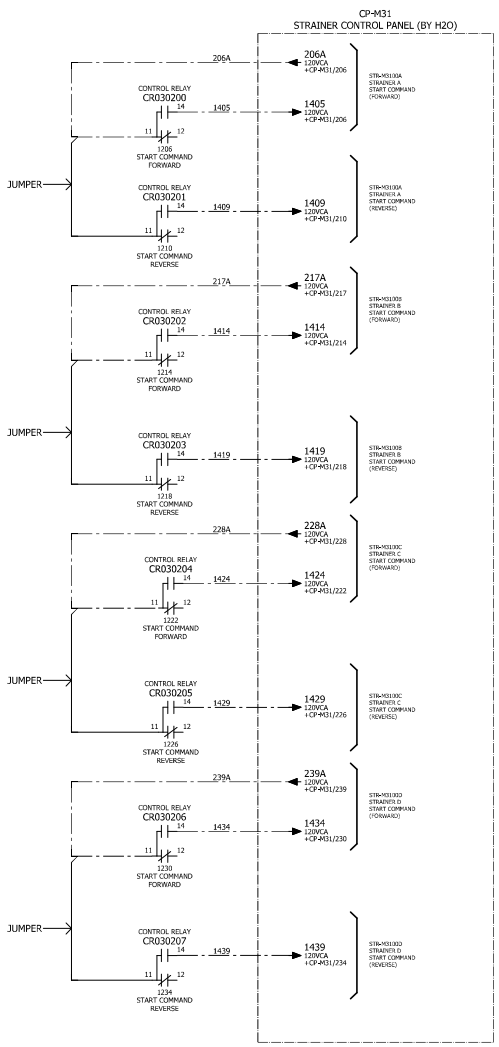


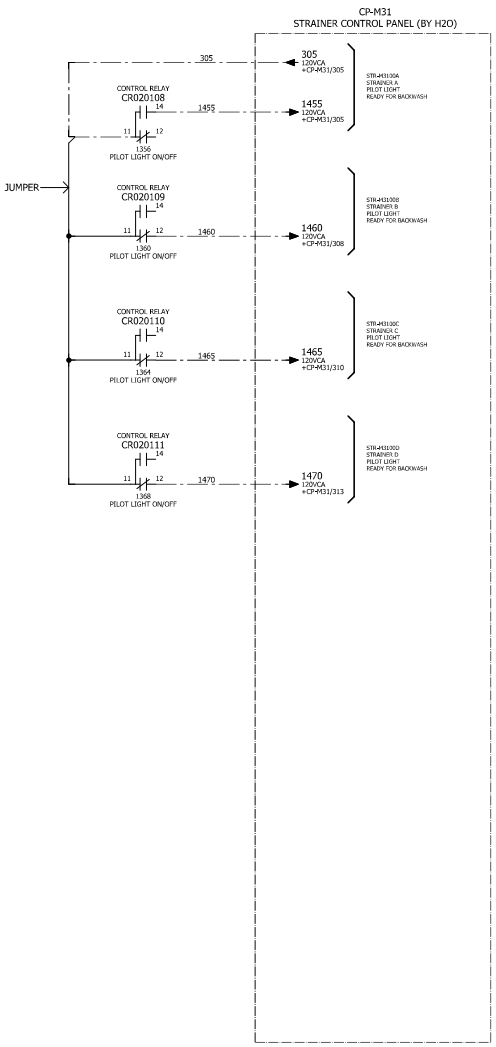


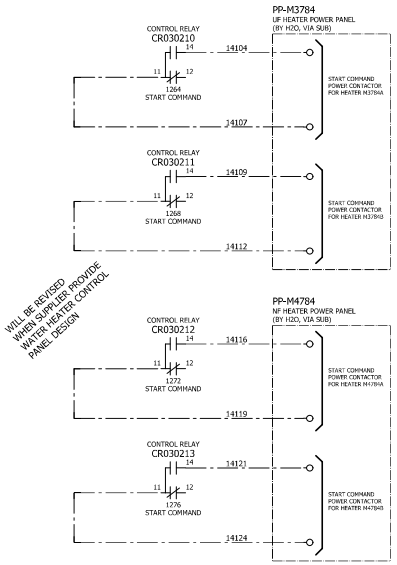


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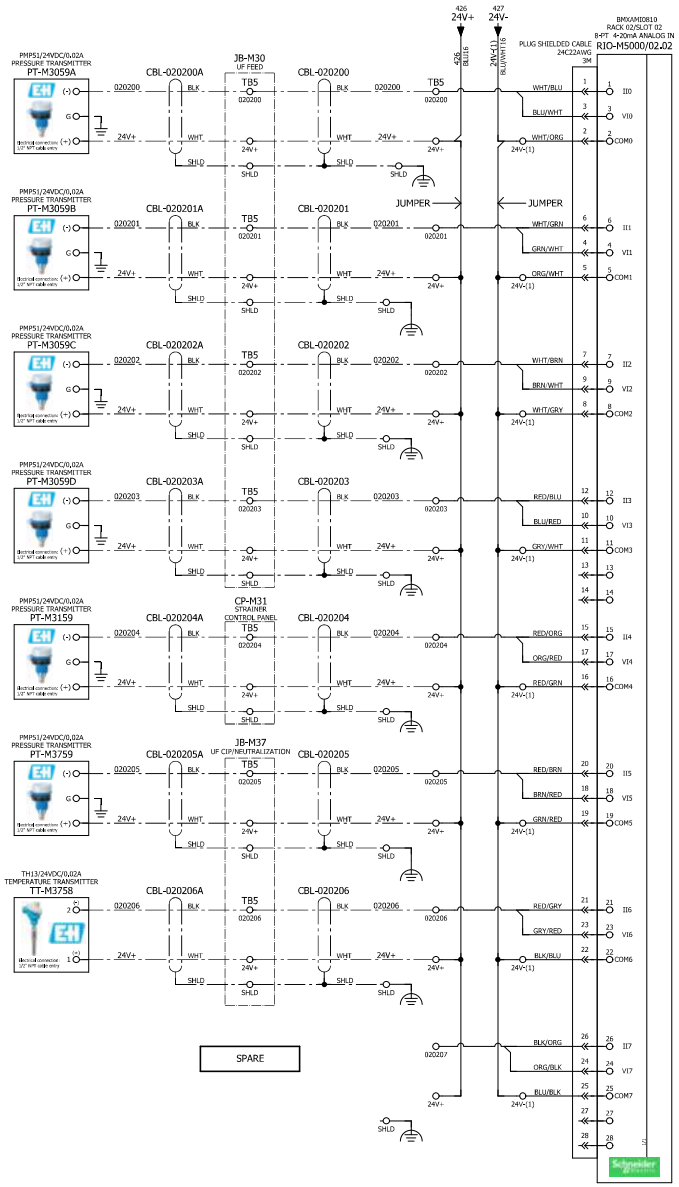


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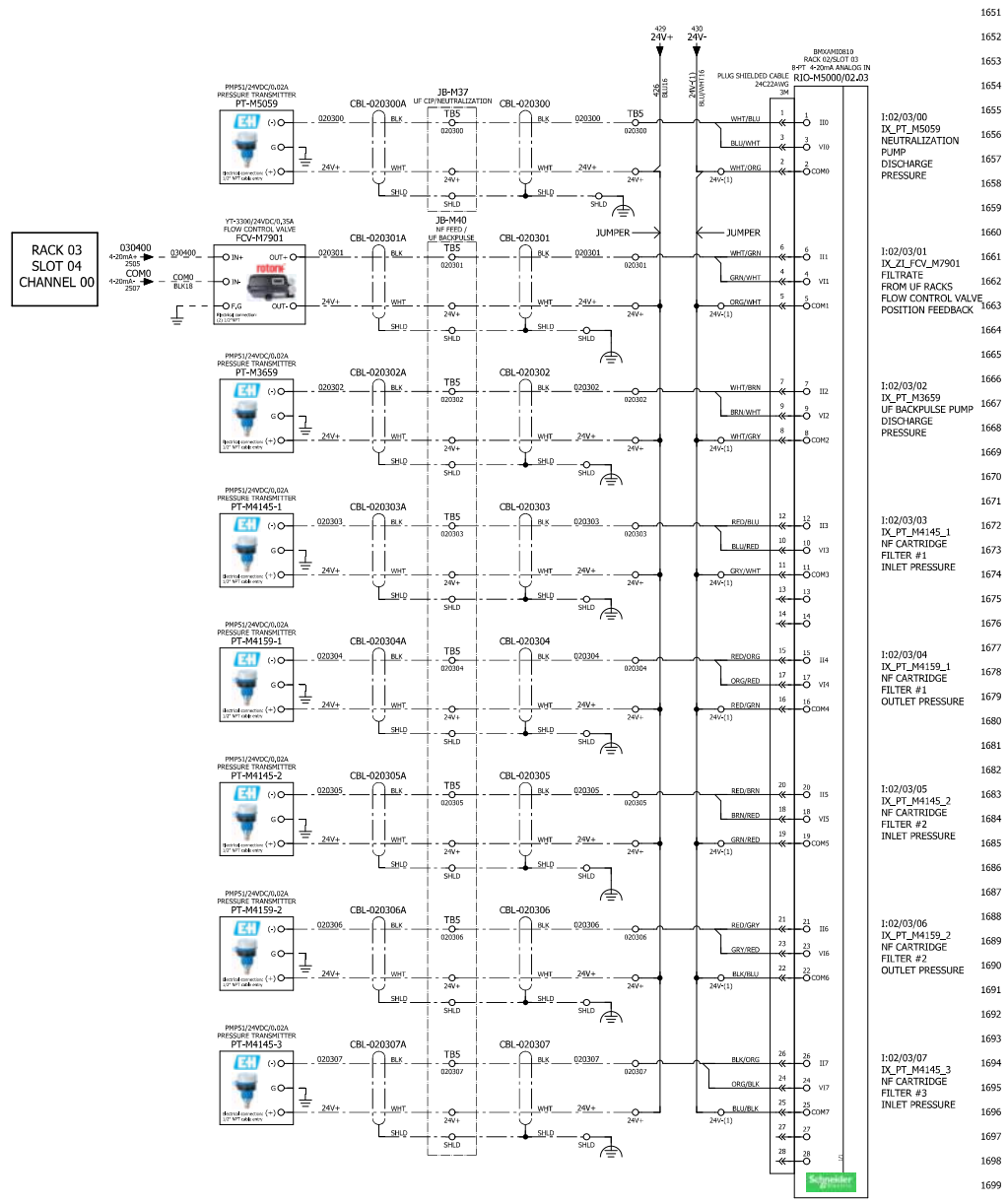


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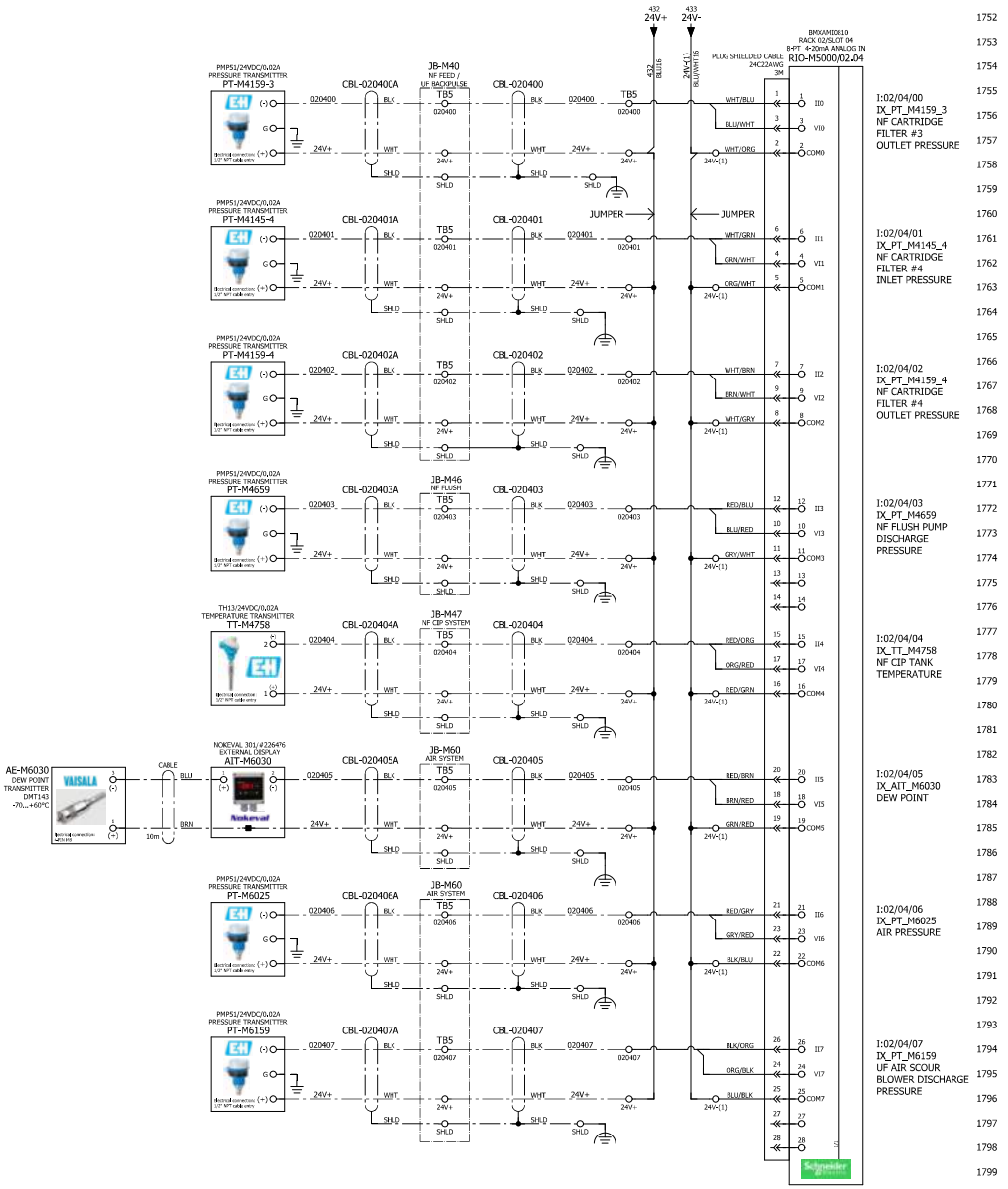


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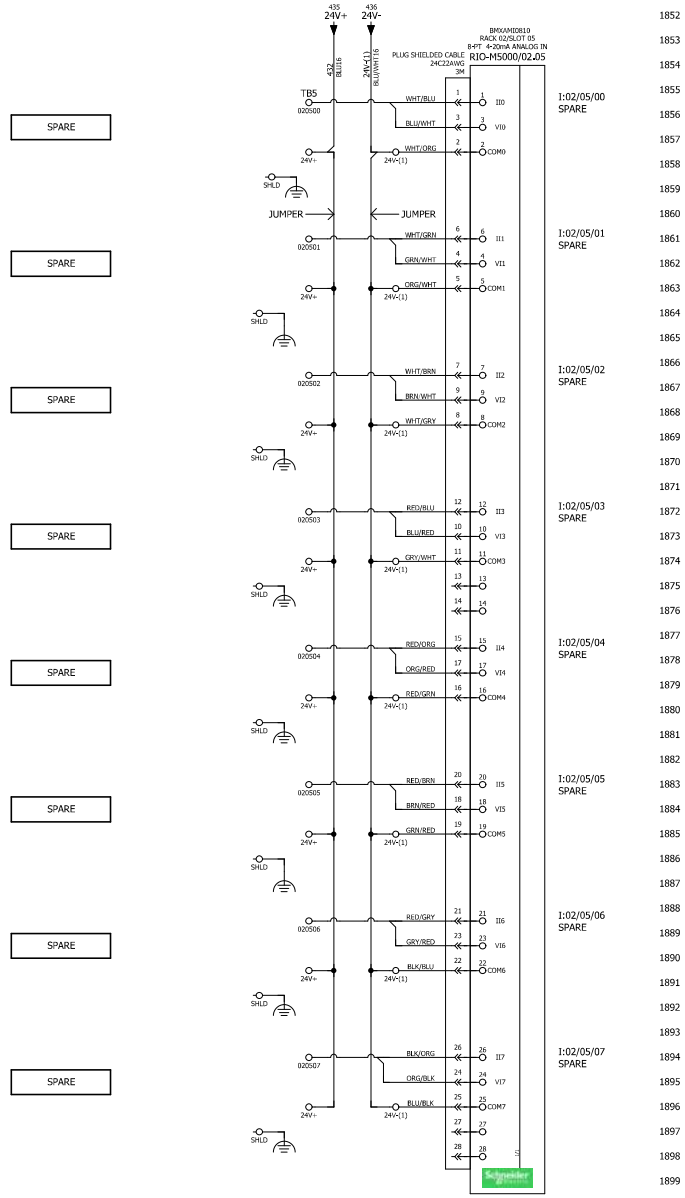


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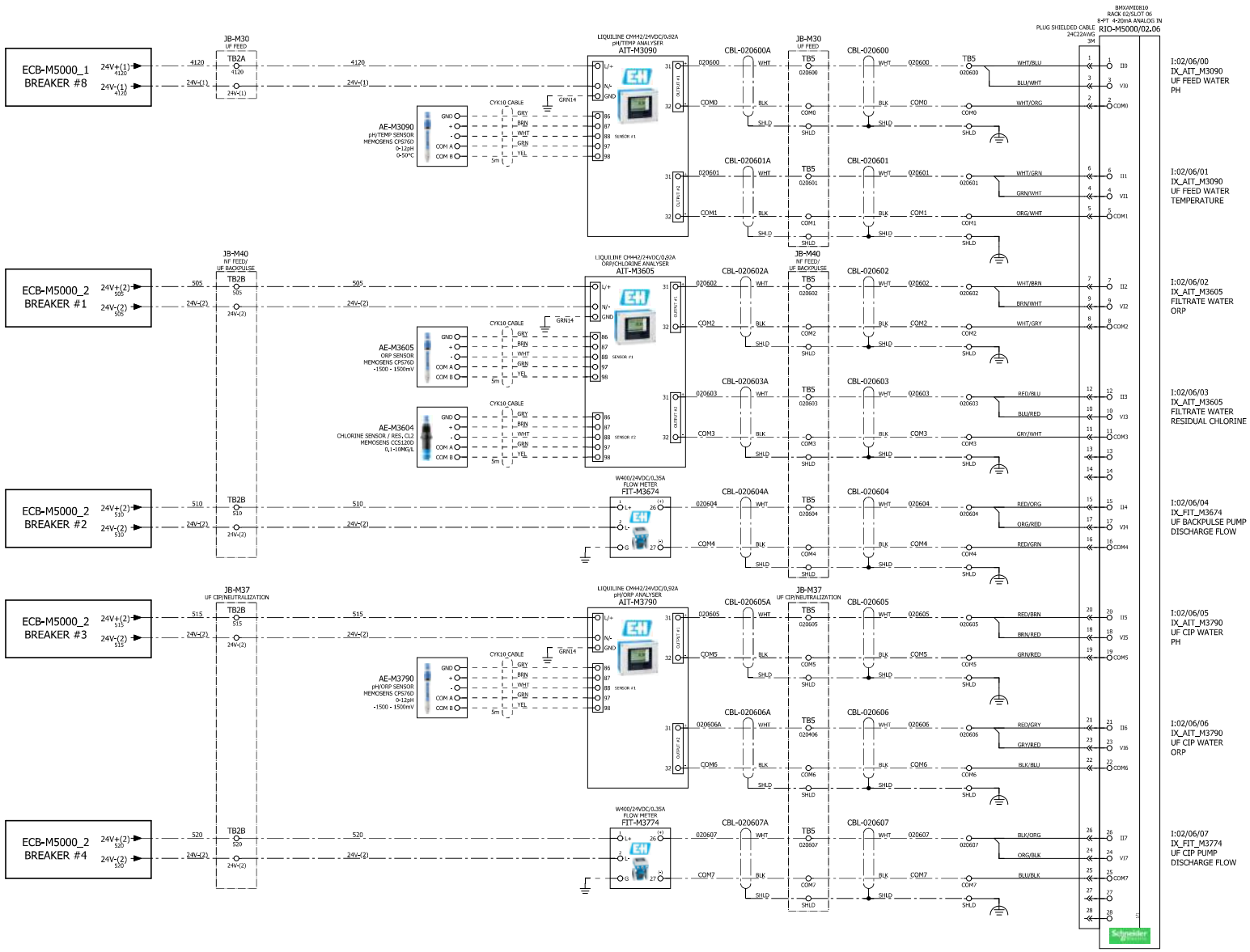


NOTES:

1. THE #CYK10 CABLE SHIELD MUST BE MECHANICALLY FASTENED THROUGH THE ANALYZER HOUSING CABLE CLAMP.

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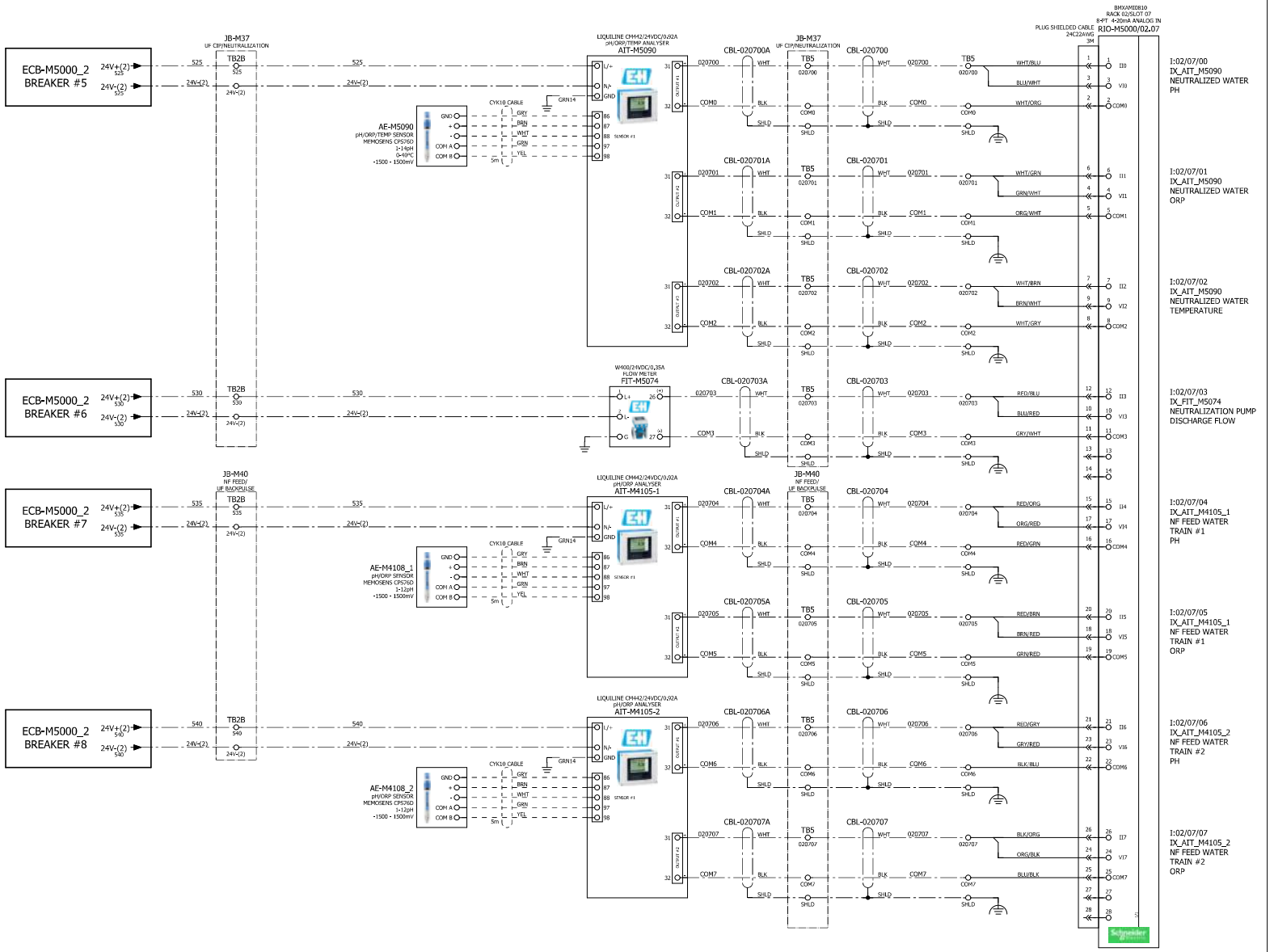


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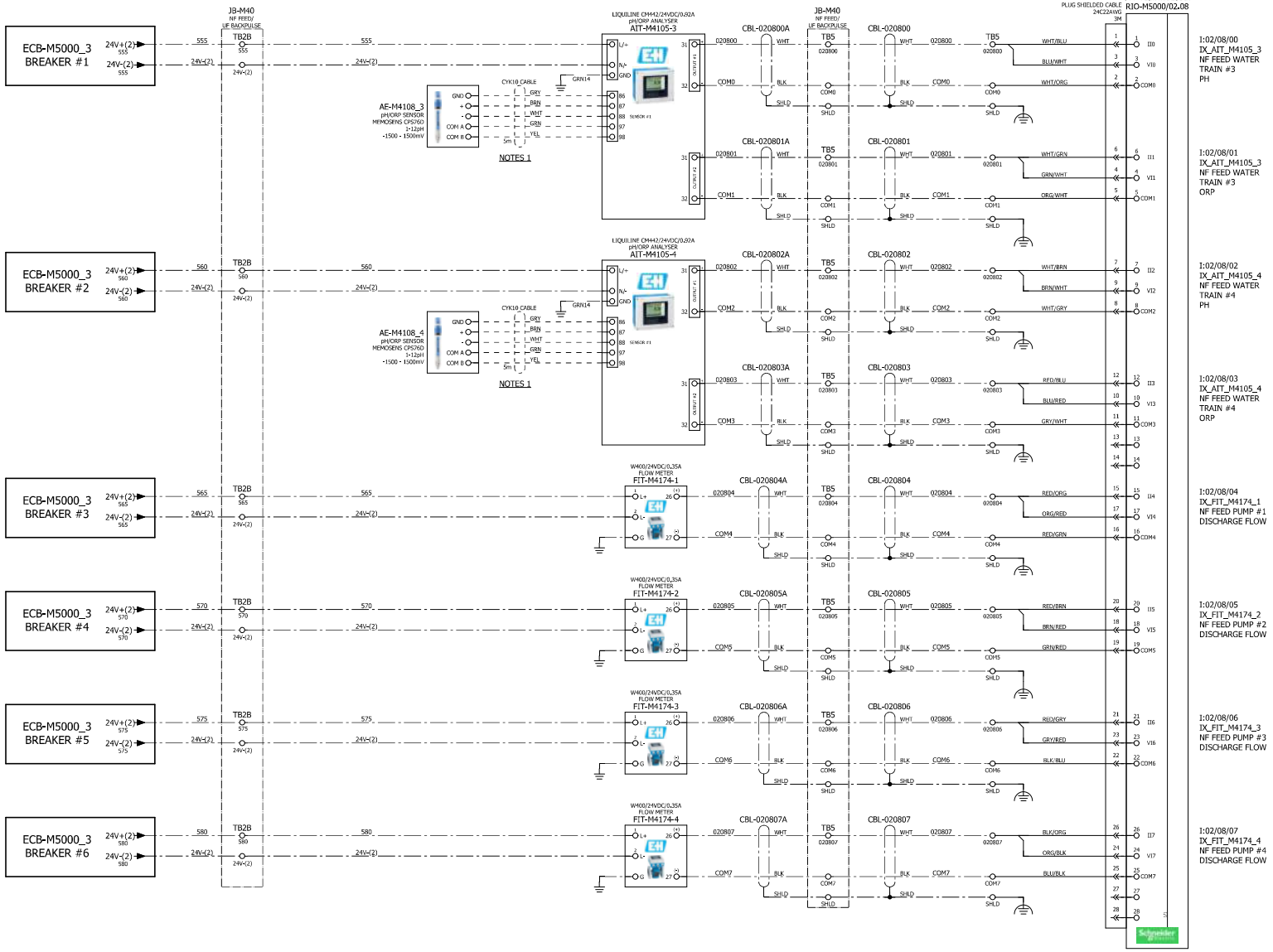


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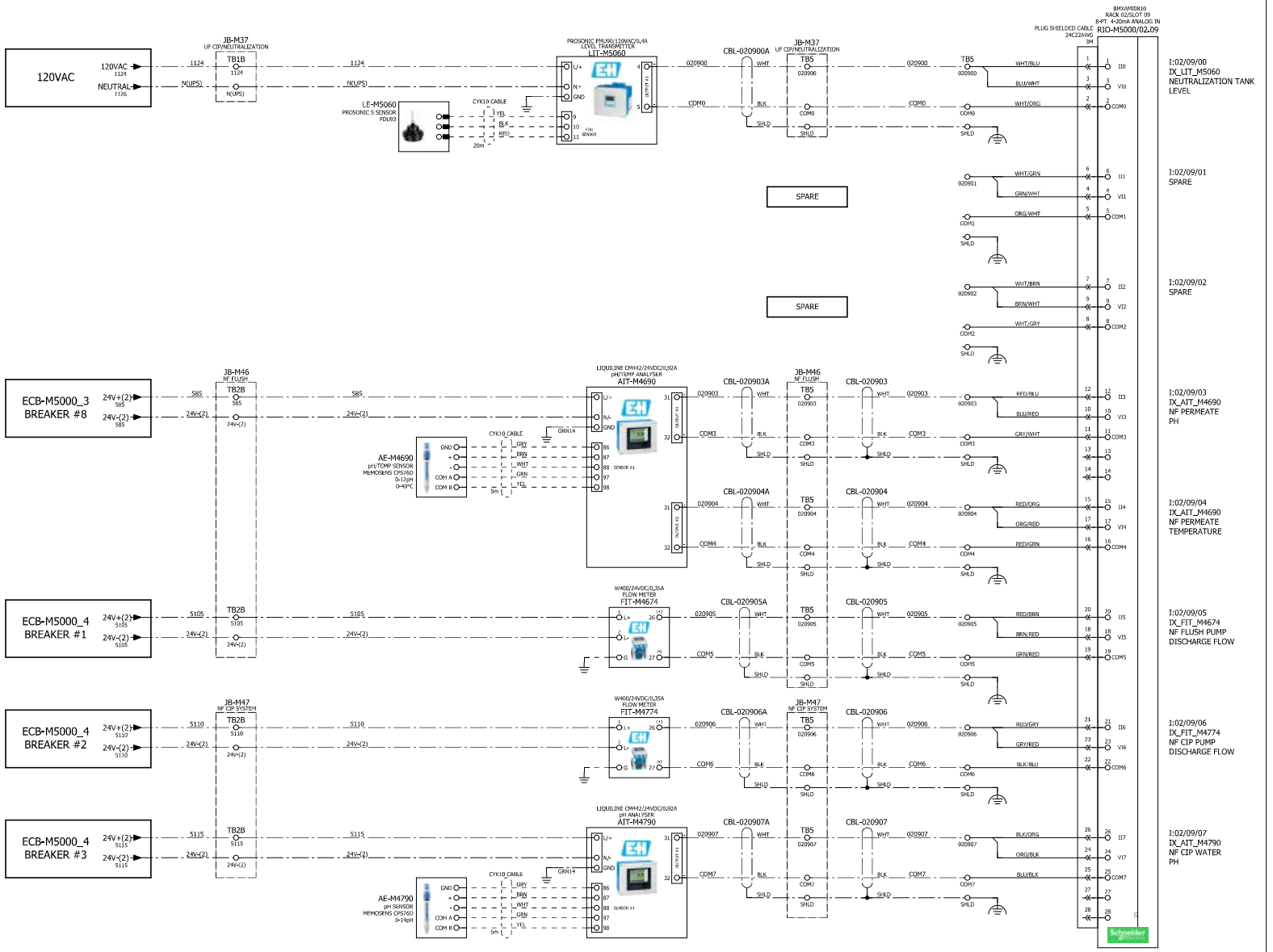


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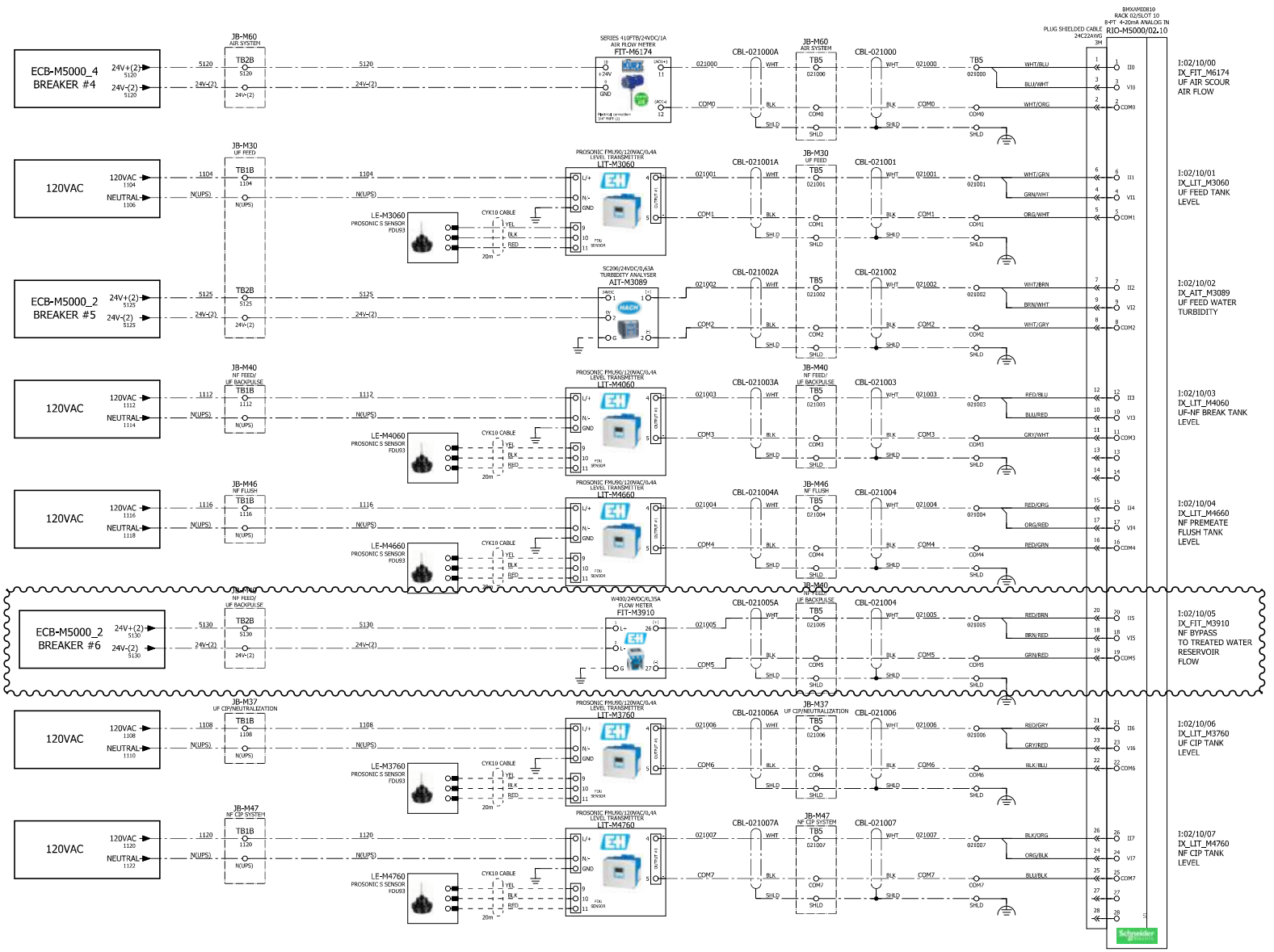


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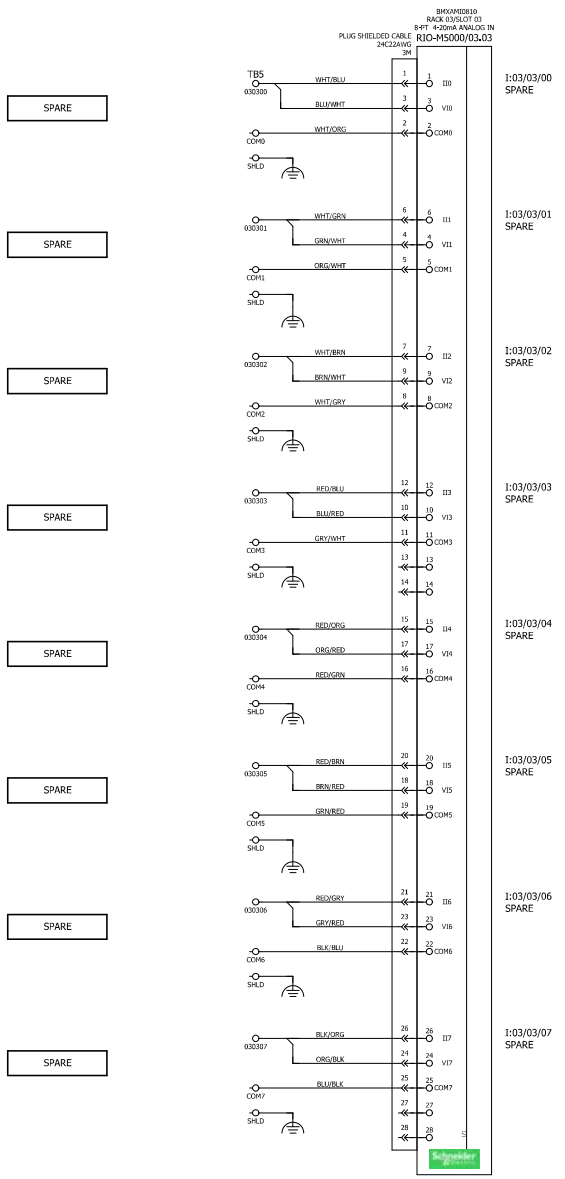


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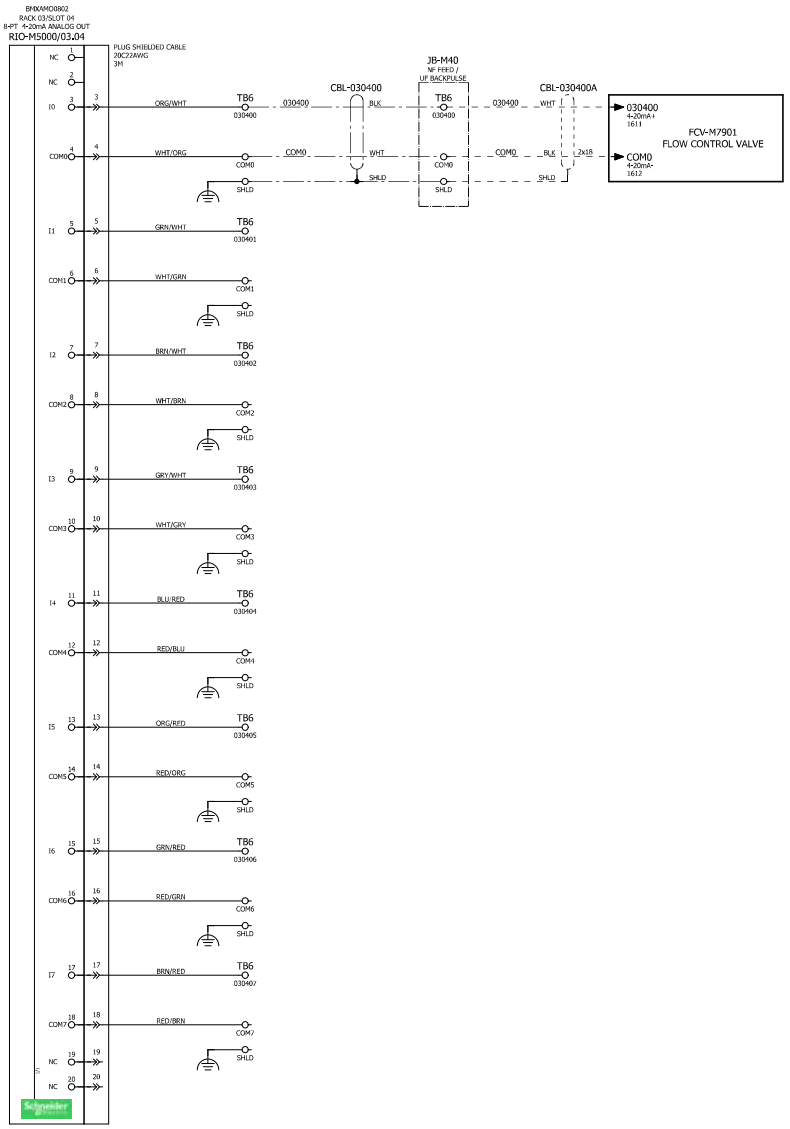


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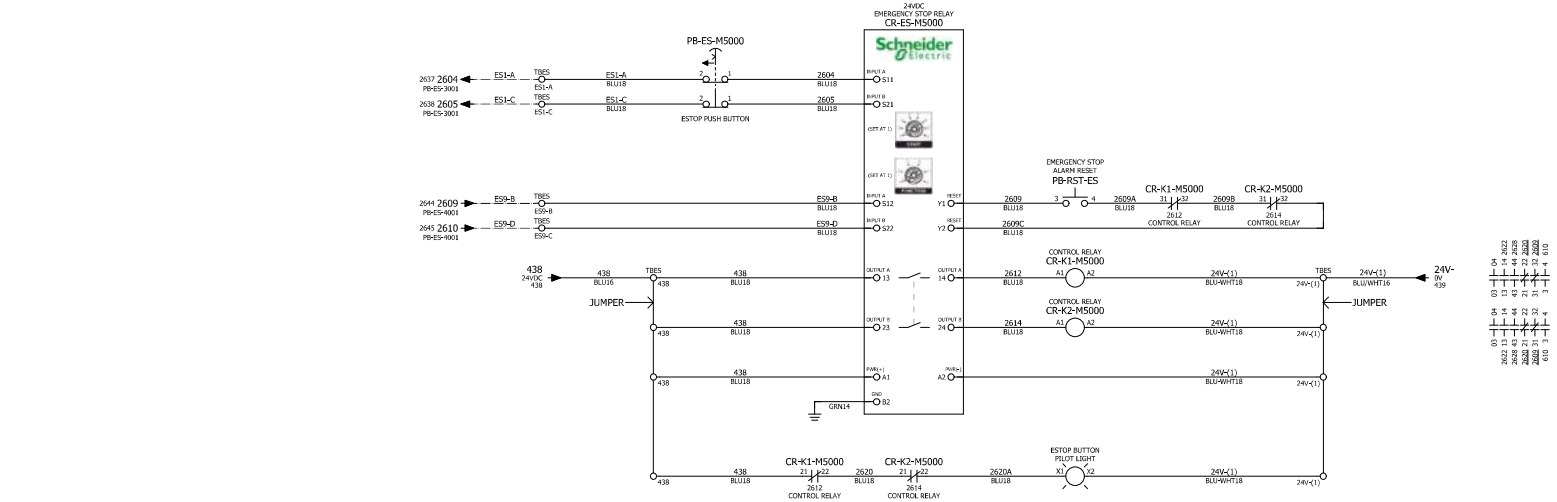


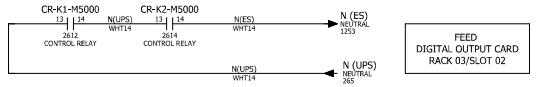


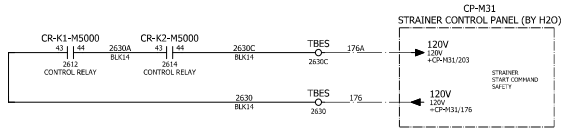


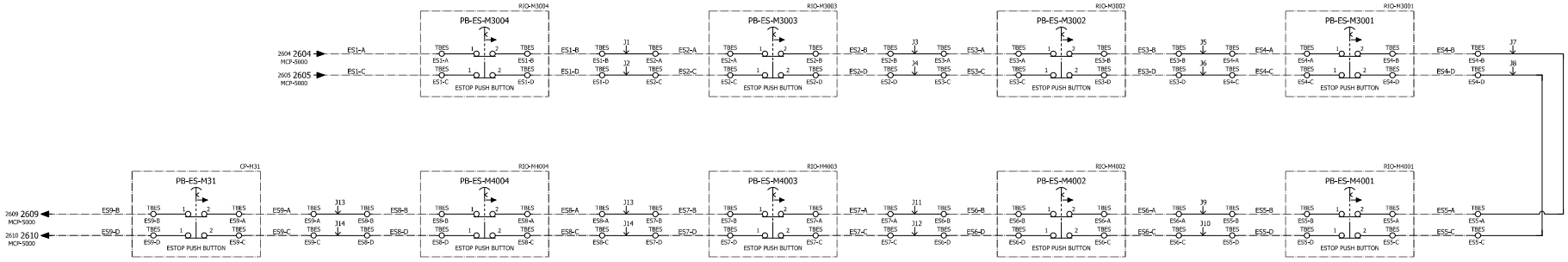


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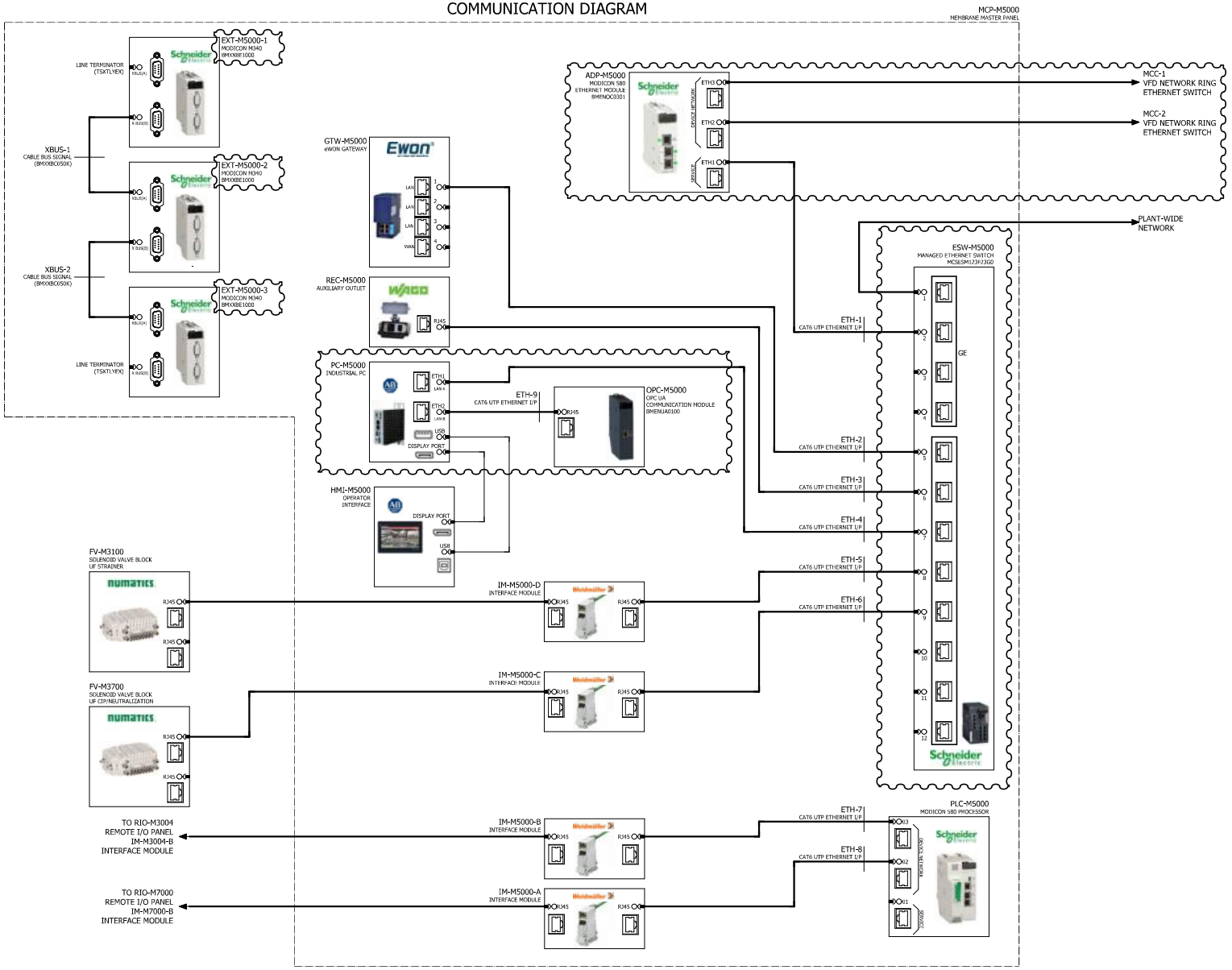
# COMMUNICATION DIAGRAM

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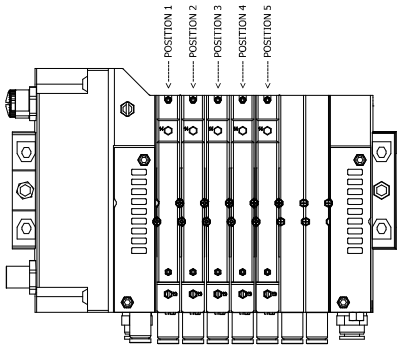
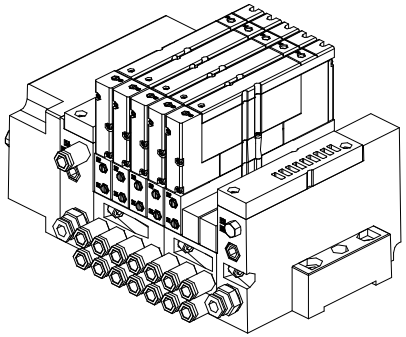
# PNEUMATIC VALVE MANIFOLD
# ETHERNET/IP FIELDBUS COMMUNICATION

MODEL: NUMATICS 501 SERIES
P/N: K501AV8J200VMUF (FV-M3100)
K501AV8P200VMUF (FV-M3700)



| FV-M3100 UF STRAINER SOLENOID BLOCK | |
|---|---|
| POSITION | VALVE TAG |
| 1 | FV-M3152A |
| 2 | FV-M3152B |
| 3 | FV-M3152C |
| 4 | FV-M3152D |
| 5 | FV-M3178A |
| 6 | FV-M3178B |
| 7 | FV-M3178C |
| 8 | FV-M3178D |
| 9 | SPARE |
| 10 | SPARE |

| FV-M3700 UF CIP/NEUTRALIZATION SOLENOID BLOCK | | | |
|---|---|---|---|
| POSITION | VALVE TAG | POSITION | VALVE TAG |
| 1 | FV-M3701B | 11 | FV-M7698C |
| 2 | FV-M3750 | 12 | FV-M5050 |
| 3 | FV-M7798B | 13 | FV-M5078 |
| 4 | FV-M7298A | 14 | SPARE |
| 5 | FV-M7898A | 15 | SPARE |
| 6 | FV-M7898B | 16 | SPARE |
| 7 | FV-M3778A | | |
| 8 | FV-M3778B | | |
| 9 | FV-M7798A | | |
| 10 | FV-M7698A | | |

NOTES:

1. MANIFOLD SHOWN ABOVE IS FOR ILLUSTRATION PURPOSE ONLY - NOT LIMITED TO 5 POSITIONS
2. VALVE POSITION NUMBER STARTING FROM LEFT TO RIGHT

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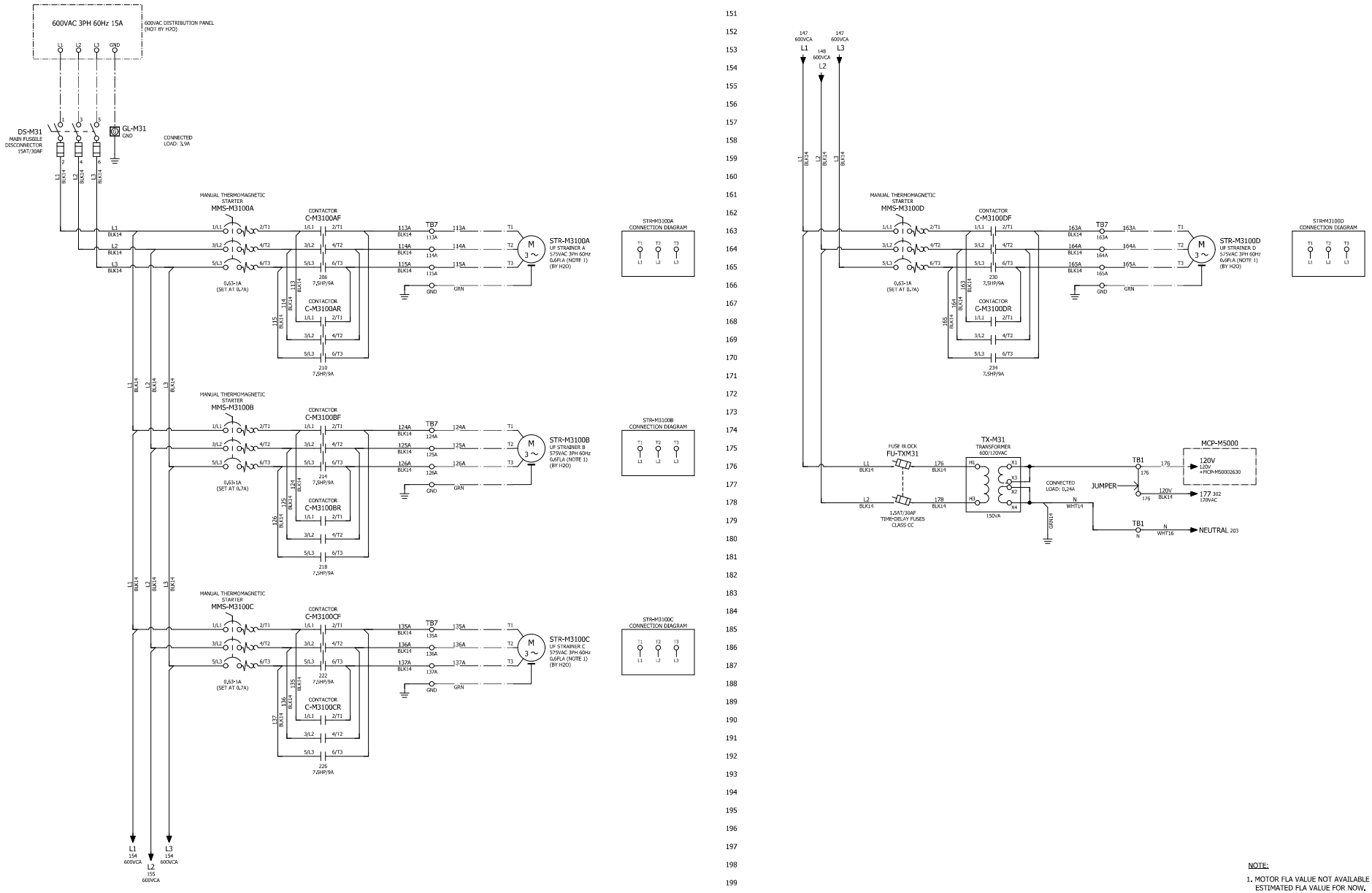


NOTE:

1. MOTOR FLA VALUE NOT AVAILABLE FROM SUPPLIER YET. ESTIMATED FLA VALUE FOR NOW.

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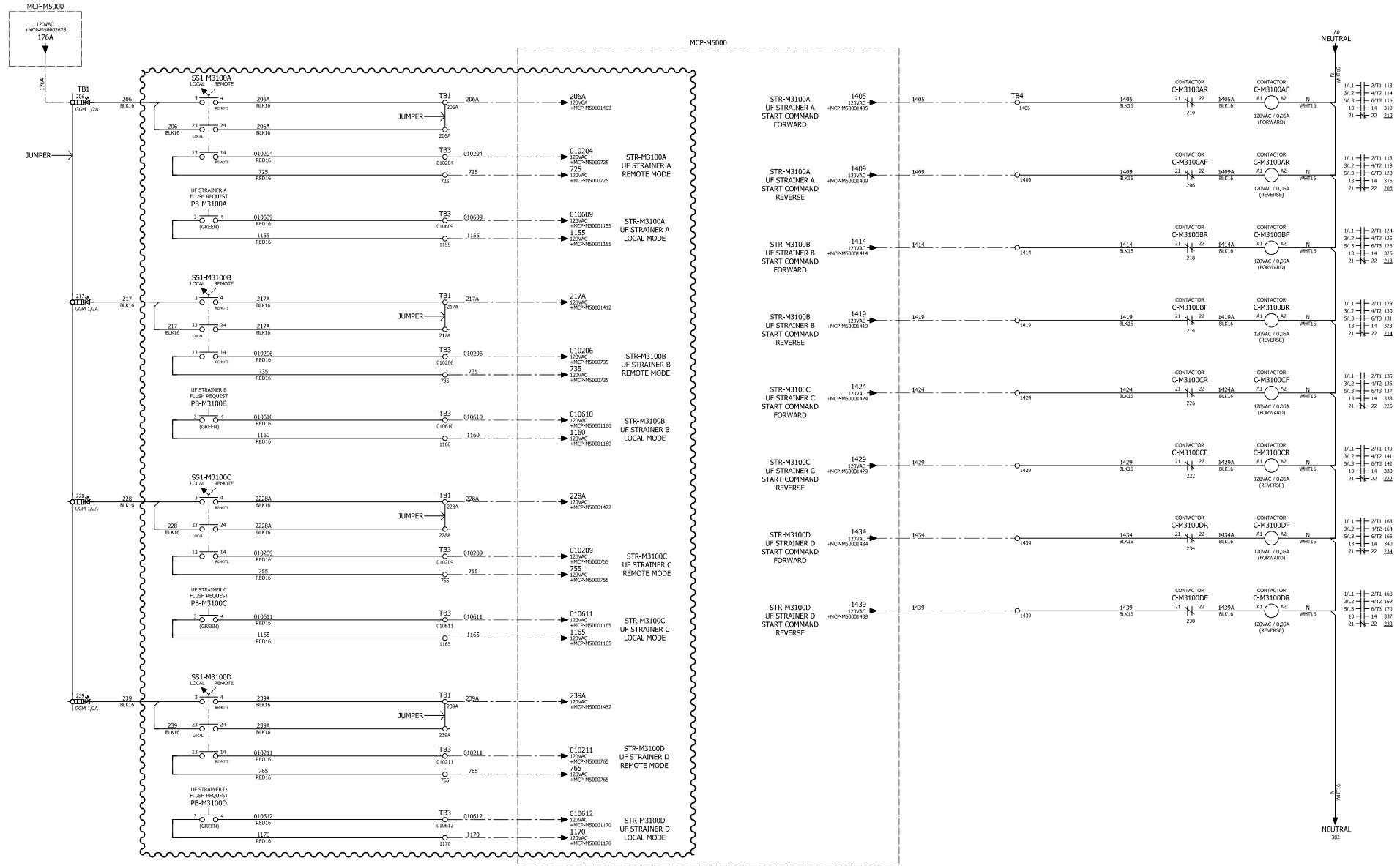


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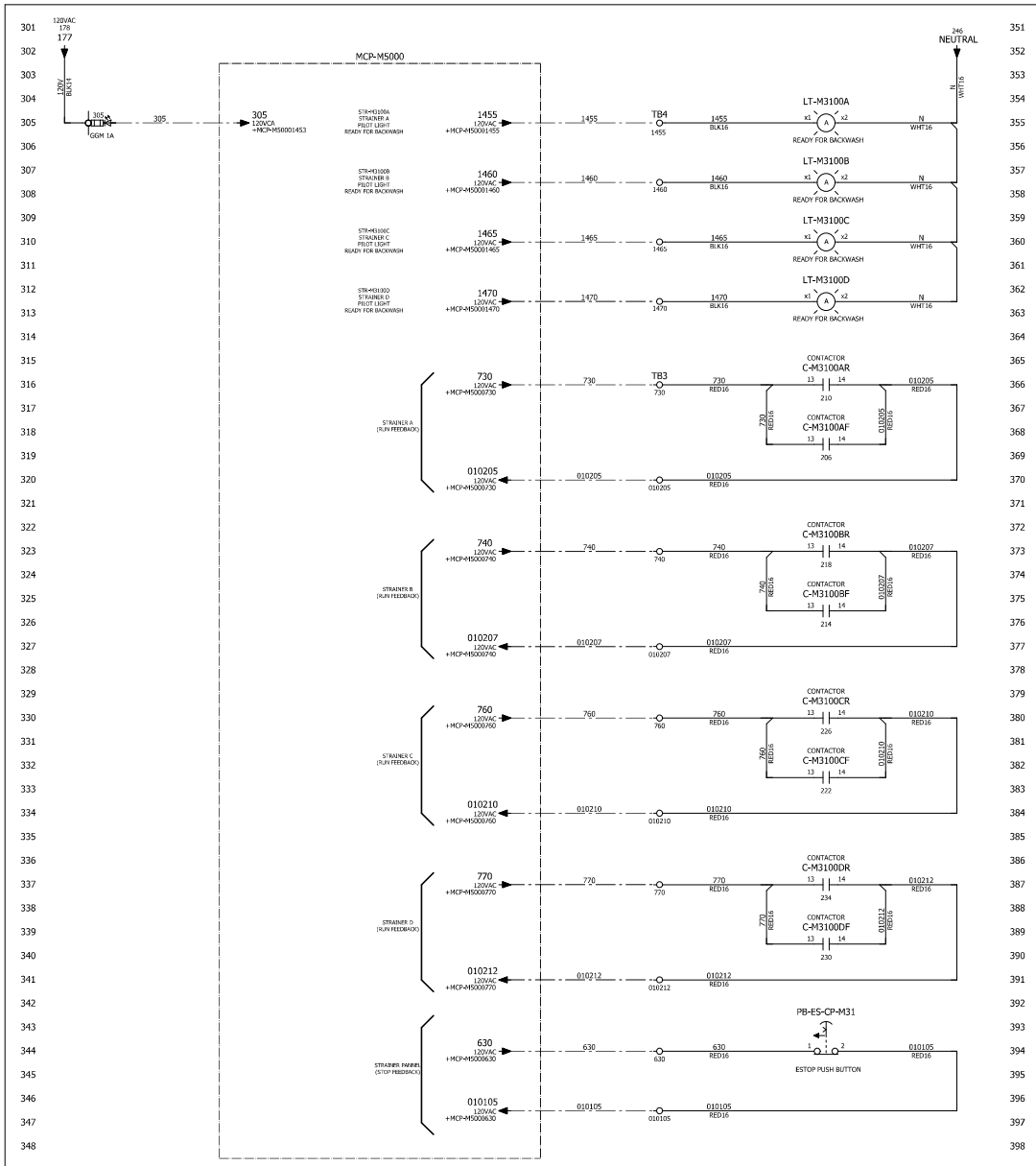


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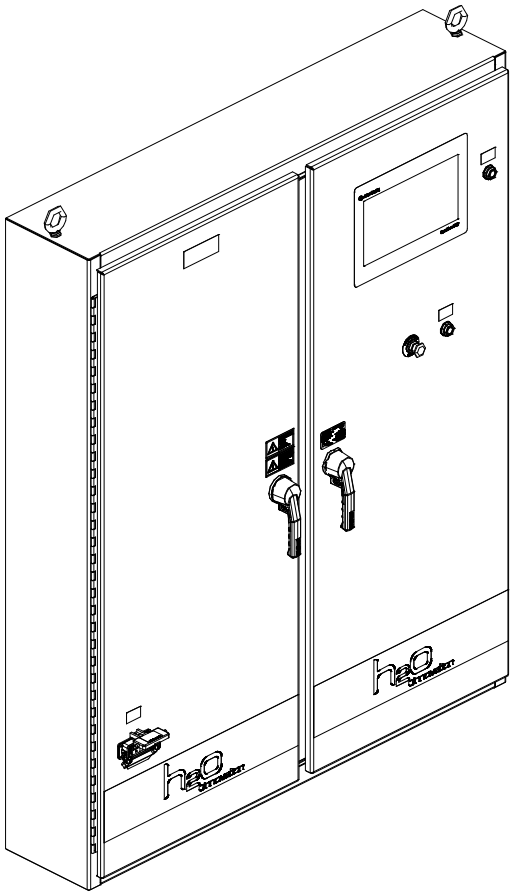
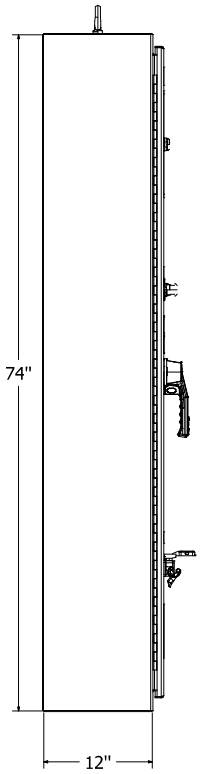
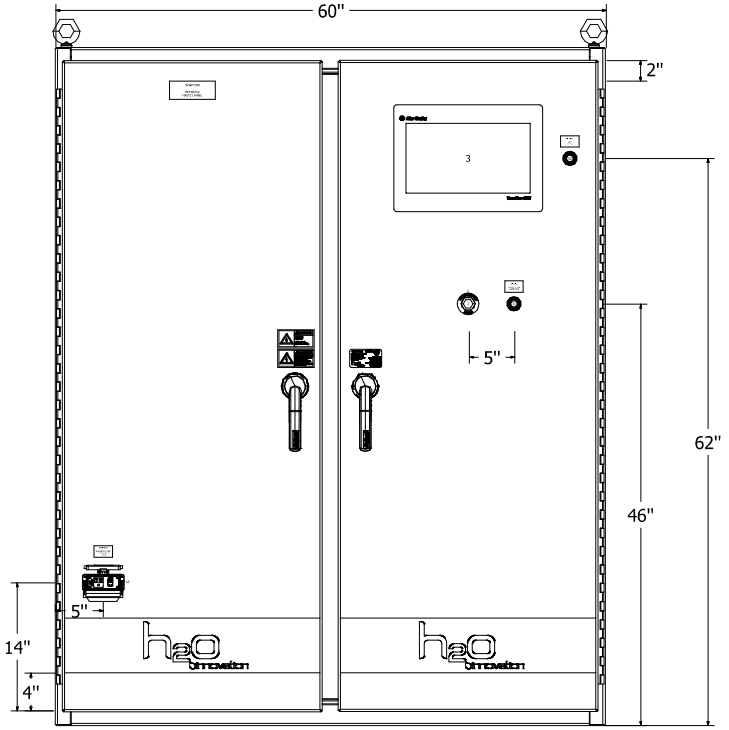
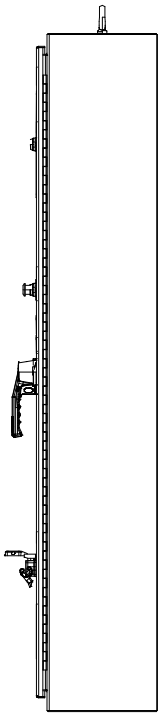
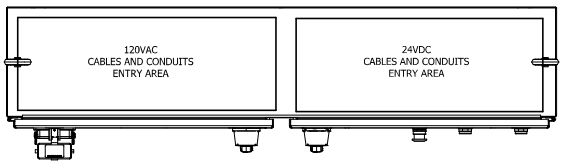


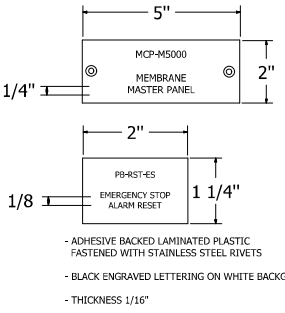


TOP VIEW




- ADHESIVE BACKED LAMINATED PLASTIC FASTENED WITH STAINLESS STEEL RIVETS
- BLACK ENGRAVED LETTERING ON WHITE BACKGROUND
- THICKNESS 1/16"

NOTE 1: THE CONTROL PANEL WILL BE LOCATED IN THE I&C ROOM (2ND FLOOR)

NOTE 2: ALL CONNECTIONS WILL BE THROUGH THE TOP

NOTE 3: PANEL WEIGHT: APPROX. 800 LBS

NOTE 4: INDUSTRIAL CONTROL PANEL, US AND CANADA (UL 508A), NITW, NITW7

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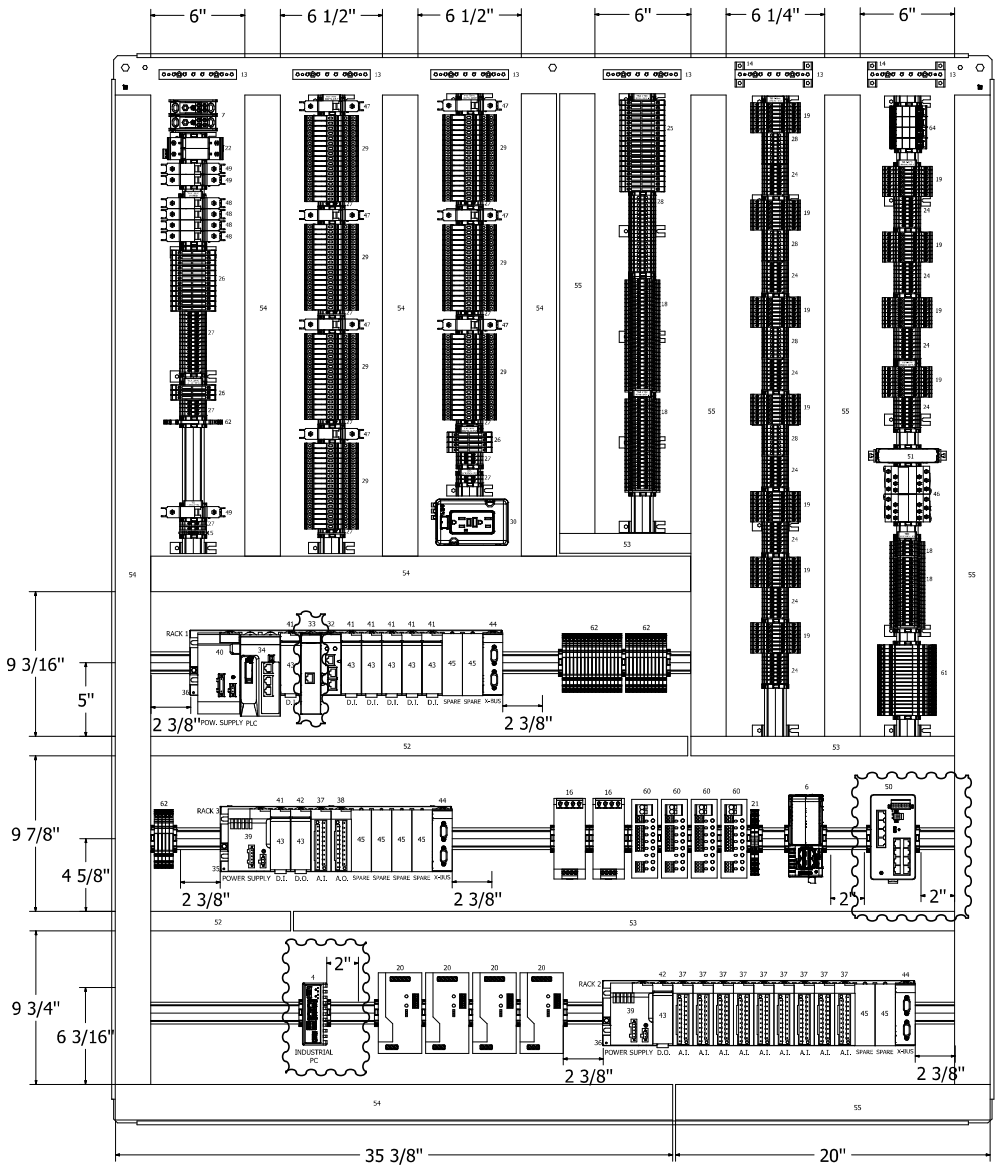


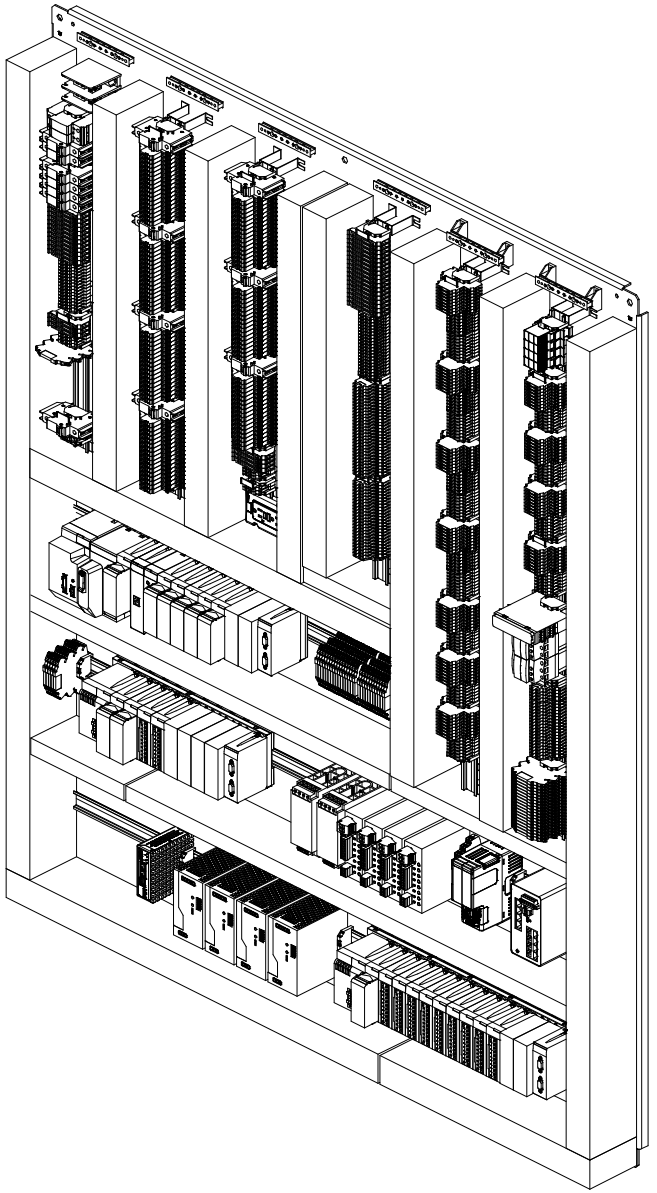

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## BILL OF MATERIALS

| ITEM # | QTY | DEVICE TAG | PART NUMBER | MANUFACTURER | DESCRIPTION | |
|---|---|---|---|---|---|---|
| 1 | 1 | PB-ES-M5000 | 800F-15YE112 | ALLEN-BRADLEY | EMERGENCY STOP LEGEND PLATE, YELLOW, 60MM ROUND, 30.5MM MOUNTING HOLE, ENGLISH DESCRIPTION | DATASHEET |
| 2 | 1 | PB-ES-M5000 | 800HC-FRXTQH2RA5 | ALLEN-BRADLEY | ILLUMINATED EMERGENCY STOP BUTTON, 30.5MM, PUSH-PULL/TWIST, RED MUSHROOM, 12-130V AC/DC LED, 2 N.C.L.B. CONTACTS, PLASTIC, TYPE 4/4X/13 | DATASHEET |
| | 1 | PB-ES-M5000 | 800T-XD2 | ALLEN-BRADLEY | CONTACT BLOCK, 1 NC EXTENSION | DATASHEET |
| 3 | 1 | HMI-M5000 | 6200M-15WBN | ALLEN-BRADLEY | VERSAVIEW 5100 INDUSTRIAL MONITOR, 15.6-INCH, 1366X768 RESOLUTION, 24VDC | DATASHEET |
| 4 | 1 | PC-M5000 | 6300B-BMADNA-AB8ANNALLEN-BRADLEY | ALLEN-BRADLEY | VERSAVIEW 6300B COMPACT BOX PC, INTEL ATOM x7, 1.6GHz CPU, 4GB RAM, 120GB SSD, 24VDC | DATASHEET |
| | 1 | PC-M5000 | 6300V-BDINA | ALLEN-BRADLEY | DIN RAIL MOUNT BRACKET KIT FOR PC VERSAVIEW 6300B COMPACT BOX | DATASHEET |
| | 1 | HMI-M5000 | 9701M-VWSTNST30 | ALLEN-BRADLEY | FACTORYTALK VIEW SITE EDITION (SE) SOFTWARE, 100 DISPLAY | DATASHEET |
| 5 | 1 | N/A | ECD18 | CROUSE-HINDS | COMBINATION DRAIN OR BREATHER, 1/2" MALE THREAD, STAINLESS STEEL | DATASHEET |
| | 1 | UPS-M5000 | 5P3000 | EATON | UNINTERRUPTIBLE POWER SUPPLY, TOWER, 3000VA, 120VAC | DATASHEET |
| | 1 | GTW-M5000 | FAC90901_0100 | EWON | CELLULAR ANTENNA - 4G BRACKET - 5 METER CABLE | DATASHEET |
| | 1 | GTW-M5000 | FLB3205 | EWON | 4G CELLULAR COM, EXTENTION CARD FOR FLEXY 205 | DATASHEET |
| 6 | 1 | GTW-M5000 | FLEXY20500 | EWON | FLEXY 205 EWON GATEWAY BASE MODULE, 24VDC | DATASHEET |
| | 238 | TB3 | GGM1/2 | FERRAZ | FAST ACTING GLASS FUSE 1/2A | DATASHEET |
| | 74 | TB1A;TB1B;TB2A;TB4 | GGM2 | FERRAZ | FAST ACTING GLASS FUSE 2A | DATASHEET |
| 7 | 1 | DB1-M5000 | MPDB63132 | FERRAZ | POWER DISTRIBUTION BLOCK - 2 POLES - 135A - 1 IN - 4 OUT | DATASHEET |
| | 2 | DB1-M5000 | MPDBC6263 | FERRAZ | MPDB63 SERIES SAFETY COVER | DATASHEET |
| 8 | 1 | N/A | A72P60 | HOFFMAN | MOUNTING PANEL, WHITE PAINTED STEEL, 72X60" | DATASHEET |
| 9 | 1 | N/A | A74H6012SSLP3PT | HOFFMAN | TWO-DOOR ENCLOSURE WITH FLOOR STANDS AND 3-POINT LATCH, NEMA4X, SS304, 74X60X12" | DATASHEET |
| 10 | 1 | N/A | AGS808 | HOFFMAN | GROUNDING STRAP | DATASHEET |
| 9 | 3 | N/A | AHCI10E | HOFFMAN | CORROSION INHIBITORS EMITTER PROTECTS, 10 CUBIC FEET | DATASHEET |
| 11 | 2 | SW1-M5000;SW2-M5000 | ALFSWD | HOFFMAN | ENCLOSURE LIGHT SWITCH, ON/OFF | DATASHEET |
| 12 | 2 | LED1-M5000;LED2-M5000 | LEDA1S35 | HOFFMAN | LED CABINET LIGHT KIT, 120VAC, SCREW MOUNTING | DATASHEET |

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|---|---|---|---|---|---|---|
| | 1 | REC2-M5000 | 5262-IGO | LEVITON | ORANGE DUPLEX RECEPTACLE, 15A, 125VAC, NEMA 5-15R | DATASHEET |
| | 1 | REC2-M5000 | 80703-ORG | LEVITON | 1-GANG ORANGE DUPLEX RECEPTACLE WALLPLATE | DATASHEET |
| 13 | 6 | GND;SHLD | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 14 | 2 | SHLD | UGB-IN-SO | PANDUIT | GROUND ISOLATOR | DATASHEET |
| | 2 | TB1A;TB2A | 0203250 | PHOENIX CONTACT | 10 POLES FIXED BRIDGE SCREW | DATASHEET |
| 15 | 1 | TB0 | 0443081 | PHOENIX CONTACT | SINGLE-LEVEL GROUNDING TERMINAL BLOCK, SCREW, GREEN/YELLOW | DATASHEET |
| 16 | 2 | RDY1-M5000;RDY2-M5000 | 2320157 | PHOENIX CONTACT | REDUNDANCY MODULE 12-24VDC/2X20A/1X40A | DATASHEET |
| 17 | 4 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 18 | 75 | TB2A;TB2B;TBES | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 19 | 88 | TB5;TB6 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 20 | 4 | PS1-M5000;PS2-M5000;PS3-M5000;PS4-M5000 | 2904602 | PHOENIX CONTACT | POWER SUPPLY, QUINT SERIES, 120/240VAC - 24VDC, 20A, 480W | DATASHEET |
| 21 | 2 | ECB-M5000-5;ECB-M5000-6 | 2909903 | PHOENIX CONTACT | DC ELECTRONIC CIRCUIT BREAKER, 1-POLE, 2A, NEC CLASS 2 | DATASHEET |
| | 1 | SS-M5000 | 2910335 | PHOENIX CONTACT | SURGE PROTECTIVE DEVICE (REPLACEMENT PLUG), TYPE 1, 120/240V AC, 20kA | DATASHEET |
| | 1 | SS-M5000 | 2910342 | PHOENIX CONTACT | SURGE PROTECTIVE DEVICE (REPLACEMENT PLUG), TYPE 1, 277/480V AC, 20kA | DATASHEET |
| 22 | 1 | SS-M5000 | 2910349 | PHOENIX CONTACT | SURGE PROTECTIVE DEVICE, TWO CHANNEL, TYPE 1, 120V AC, 80A, 20kA | DATASHEET |
| 23 | 28 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 24 | 88 | TB5;TB6 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 25 | 18 | TB2A | 3004126 | PHOENIX CONTACT | 24VDC FUSE TERMINAL BLOCK, TYPE, SCREW, 6.3A, 24-12AWG, BLACK | DATASHEET |
| 26 | 19 | TB1A;TB1B;TB4 | 3004142 | PHOENIX CONTACT | 120VAC FUSE TERMINAL BLOCK, TYPE, SCREW, 6.3A, 24-12AWG, BLACK | DATASHEET |
| 27 | 34 | TB0;TB1A;TB1B;TB3;TB4;TBES | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |
| 28 | 52 | TB2A;TB5 | 3004388 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, BLU | DATASHEET |
| 29 | 119 | TB3 | 3007204 | PHOENIX CONTACT | DOUBLE DECK FUSED TERMINAL BLOCK, SCREW, 32A, AWG: 24-12, BLACK | DATASHEET |

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## BILL OF MATERIALS

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|---|---|---|---|---|---|---|
| | 1 | ECB-M5000-5 | 3030271 | PHOENIX CONTACT | PLUG-IN BRIDGE, 6.2MM PITCH, 10 POLES, RED | DATASHEET |
| | 8 | TB2A;TB3 | 3118135 | PHOENIX CONTACT | 10 POLES JUMPER BAR | DATASHEET |
| | 1 | REC2-M5000 | 077602 | SCEPTER | 1-GANG RIGID PVC BOX, 1 OUTLET 3/4", FS15 | DATASHEET |
| 31 | 2 | PB-RST-ALM;PB-RST-ES | 9001SKR1UH13 | SCHNEIDER ELECTRIC | PLASTIC PUSH BUTTON 30MM, 7 COLOURED CAPS, 1NO-1NC CONTACT | DATASHEET |
| 32 | 1 | ADP-M5000 | BMENOC0301 | SCHNEIDER ELECTRIC | ETHERNET/IP MODULE M580 - 3-PORT COMUNICATION | DATASHEET |
| 33 | 1 | OPC-M5000 | BMENUA0100 | SCHNEIDER ELECTRIC | MODULE FOR M580 COMMUNICATION OPC UA | DATASHEET |
| 34 | 1 | PLC-M5000 | BMEP584040 | SCHNEIDER ELECTRIC | PROCESSOR MODULE M580 - LEVEL 4 - REMOTE | DATASHEET |
| 35 | 1 | PS-EXT2-M5000 | BMEXBP0800 | SCHNEIDER ELECTRIC | RACK X80 - 8 SLOTS - ETHERNET BACKPLANE | DATASHEET |
| 36 | 2 | PS-EXT1-M5000;PS-PLC-M5000 | BMEXBP1200 | SCHNEIDER ELECTRIC | RACK X80 - 12 SLOTS - ETHERNET BACKPLANE | DATASHEET |
| 37 | 10 | RIO-M5000/02.02...RIO-M5000/02.10;RIO-M5000/03.03 | BMXAMI0810 | SCHNEIDER ELECTRIC | MODULE X80 - ANALOG INPUT CARD, 8PT, 4-20mA / 0...10V | DATASHEET |
| 38 | 1 | RIO-M5000/03.04 | BMXAMO0802 | SCHNEIDER ELECTRIC | MODULE X80-ANALOG OUTPUT CARD 8PT | DATASHEET |
| 39 | 2 | PS-EXT1-M5000;PS-EXT2-M5000 | BMXCPS3500 | SCHNEIDER ELECTRIC | POWER SUPPLY MODULE X80 - 120-240 VAC - 36 W | DATASHEET |
| 40 | 1 | PS-PLC-M5000 | BMXCPS4002 | SCHNEIDER ELECTRIC | POWER SUPPLY MODULE X80 - 120-240 VAC - 40 W | DATASHEET |
| 41 | 7 | RIO-M5000/01.01...RIO-M5000/01.06;RIO-M5000/03.01 | BMXDAI1604 | SCHNEIDER ELECTRIC | MODULE X80 - DIGITAL INPUT CARD 16PT, 120VAC | DATASHEET |
| 42 | 2 | RIO-M5000/02.01;RIO-M5000/03.02 | BMXDRA1605 | SCHNEIDER ELECTRIC | MODULE X80 -DIGITAL OUTPUT CARD 16PT 24V DC OR 24 -240VAC | DATASHEET |
| 43 | 9 | RIO-M5000/01.01...RIO-M5000/01.06;RIO-M5000/02.01;RIO-M5000/03.01;RIO-M5000/03.02 | BMXFTB2010 | SCHNEIDER ELECTRIC | 20-WAY REMOVABLE SCREW CLAMP TERMINAL BLOCK - 1 OR 2 x 0.34 - 1.5 mm2 | DATASHEET |
| | 1 | RIO-M5000/03.04 | BMXFTW301S | SCHNEIDER ELECTRIC | SHILELDED CORD 20-WAY TERMINAL - ONE END FLYING LEADS - FOR M340 I/O - 3 m -20 X 22 AWG | DATASHEET |
| | 10 | RIO-M5000/02.02...RIO-M5000/02.10;RIO-M5000/03.03 | BMXFTW308S | SCHNEIDER ELECTRIC | SHILELDED CORD 28-WAY TERMINAL - ONE END FLYING LEADS - FOR M340 I/O - 3 m -24 X 22 AWG | DATASHEET |
| 44 | 3 | EXT-M5000-1...EXT-M5000-3 | BMXXBE2005 | SCHNEIDER ELECTRIC | MODICON M340 - AUTOMATION PLATFORM, X80 EXTENDER KIT | DATASHEET |
| | 1 | PLC-M5000 | BMXXCAUSBH045 | SCHNEIDER ELECTRIC | USB PC OR TERMINAL CONNECTING CABLE FOR MODICON PROCESSOR, 4.5M | DATASHEET |

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| 45 | 2 | N/A;PS-EXT2-M5000;PS-PLC-M5000 | BMXXEM010 | SCHNEIDER ELECTRIC | PROTECTIVE COVER - FOR UNOCCUPIED SLOTS ON M340 RACK  | DATASHEET |
| 46 | 2 | CR-K1-M5000;CR-K2-M5000 | CAD32BD | SCHNEIDER ELECTRIC | CONTROL RELAY, 24VDC COIL, 3NO + 2NC CONTACT, MECHANICALLY LINKED  | DATASHEET |
| 47 | 7 | CB-208;CB-213;CB-218;CB-223;CB-228;CB-233;CB-238 | M9F42101 | SCHNEIDER ELECTRIC | MINIATURE CIRCUIT BREAKER, 1-POLE, CURVE C, 1A  | DATASHEET |
| 48 | 4 | CB-155;CB-161;CB-167;CB-173 | M9F42110 | SCHNEIDER ELECTRIC | MINIATURE CIRCUIT BREAKER, 1-POLE, CURVE C, 10A  | DATASHEET |
| 49 | 3 | CB1-M5000;CB-125;CB-125A | M9F42125 | SCHNEIDER ELECTRIC | MINIATURE CIRCUIT BREAKER, 1-POLE, CURVE C, 25A  | DATASHEET |
| 50 | 1 | ESW-M5000 | MCSESM123F23G0 | SCHNEIDER ELECTRIC | MODICON MANAGED SWITCH - 8 PORT + 4 GIGABIT PORT  | DATASHEET |
| 51 | 1 | CR-ES-M5000 | XPSUAF13AP | SCHNEIDER ELECTRIC | SAFETY EMERGENCY STOP RELAY, 24VDC  | DATASHEET |
| 52 | 2 | N/A | TYD1X4NPG6 | THOMAS & BETTS | WIRING DUCT 1X4", GRAY  | DATASHEET |
| 53 | 3 | N/A | TYD1X4NPW6 | THOMAS & BETTS | WIRING DUCT 1X4", WHITE  | DATASHEET |
| 54 | 6 | N/A | TYD2X4NPG6 | THOMAS & BETTS | WIRING DUCT 2X4", GRAY  | DATASHEET |
| 55 | 5 | N/A | TYD2X4NPW6 | THOMAS & BETTS | WIRING DUCT 2X4", WHITE  | DATASHEET |
| 56 | 31 | N/A | CA803 | TECHSPAN | DIN RAIL ELEVATION MOUNTING BRACKET - 2"  | DATASHEET |
| 57 | 9 | N/A | DRS35X7.5S | TECHSPAN | DIN MOUNTING RAIL, ZINC  | DATASHEET |
| 58 | 90 | 1;N/A | 249-116 | WAGO | SCREWLESS END STOP  | DATASHEET |
| 59 | 13 | N/A | 249-119 | WAGO | ADJUSTABLE GROUP MARKER CARRIER  | DATASHEET |
| 60 | 4 | ECB-M5000-1...ECB-M5000-4 | 787-1668 | WAGO | 8 CIRCUITS ELECTRONIC CIRCUIT BREAKER, 2-10A  | DATASHEET |
| 61 | 19 | CR358;CR362;CR367;CR372;CR379;CR385;CR389;CR408;CR412;CR419;CR423;CR3108;CR3112;CR3117;CR3122;CR3129;CR3133;CR3138;CR3143 | 857-304 | WAGO | MINIATURE CONTROL RELAY, 24VDC, SPDT, 6A  | DATASHEET |
| 62 | 33 | CR020100...CR020115;CR030200...CR030215;CR-120V | 857-357 | WAGO | MINIATURE CONTROL RELAY, 120VAC, SPDT, 6A  | DATASHEET |
| 63 | 1 | REC1-M5000 | 8000-0100/1000-0354 | WAGO | PANEL INTERFACE RECEPTACLE, 1-120V/15A & 1-RJ45 CAT6, TYPE4/4X  | DATASHEET |

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|---|---|---|---|---|---|---|
| 64 | 4 | N/A | 8946940000 | WEIDMULLER | RJ-45 INTERFACE MODULE, CAT 6A, EIA/TIA T568 B  | DATASHEET |

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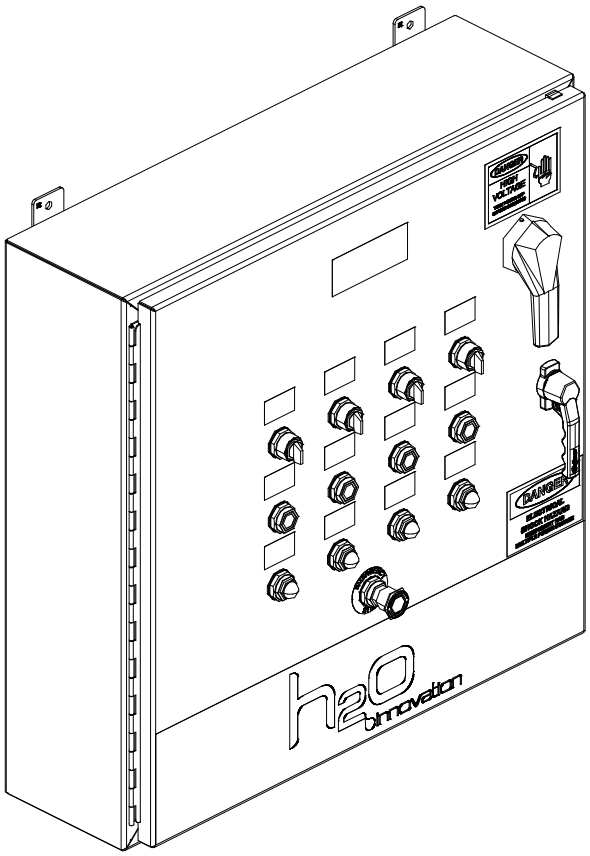


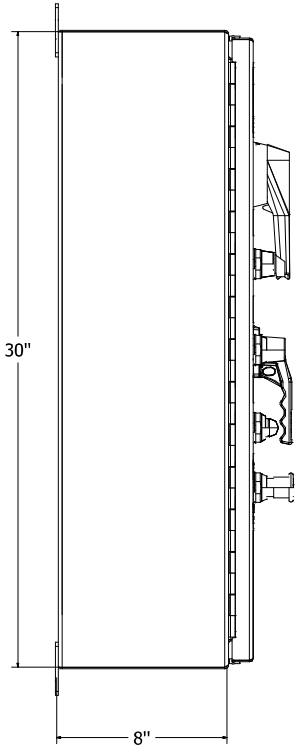


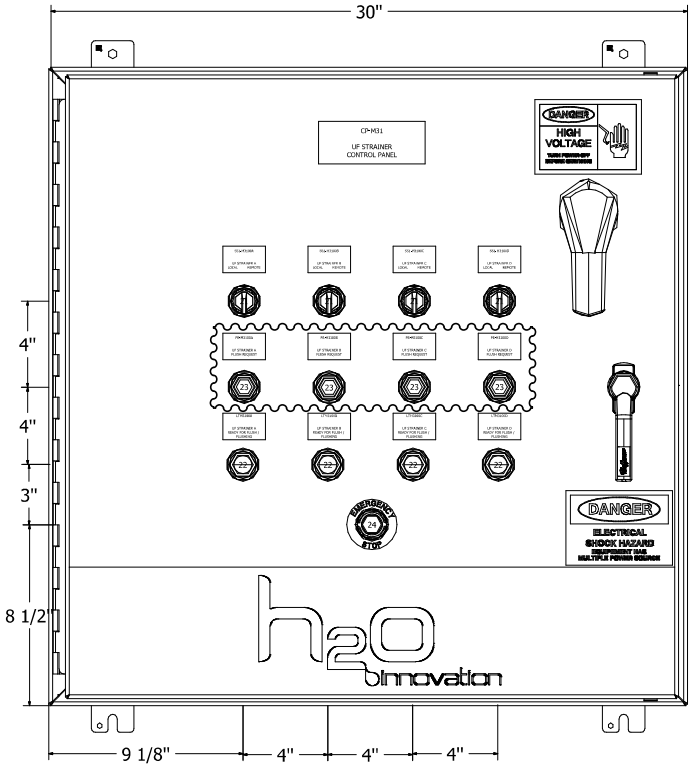


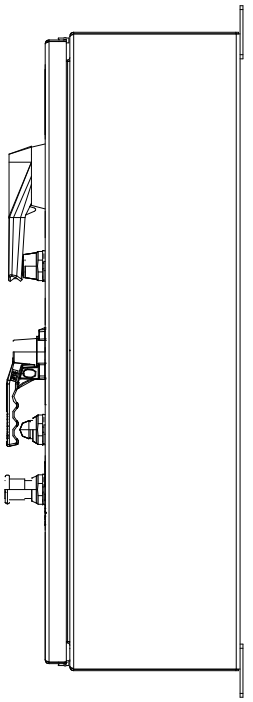

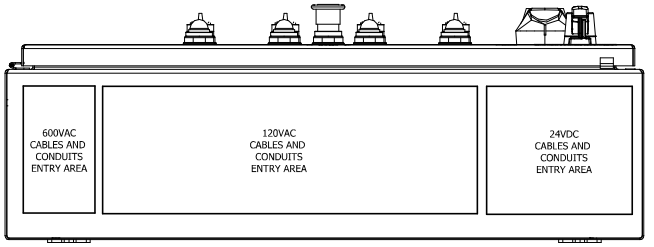


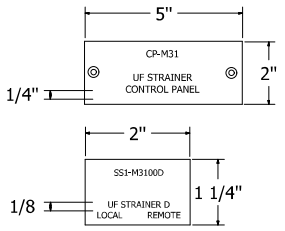


- ADHESIVE BACKED LAMINATED PLASTIC FASTENED WITH STAINLESS STEEL RIVETS
- BLACK ENGRAVED LETTERING ON WHITE BACKGROUND
- THICKNESS 1/16"

NOTE 1: THE CONTROL PANEL WILL BE SHIPPED LOOSE

NOTE 2: ALL CONNECTIONS WILL BE THROUGH THE BOTTOM

NOTE 3: PANEL WEIGHT: APPROX. 125 LBS

NOTE 4: INDUSTRIAL CONTROL PANEL, US AND CANADA (UL 508A), NITW, NITW7

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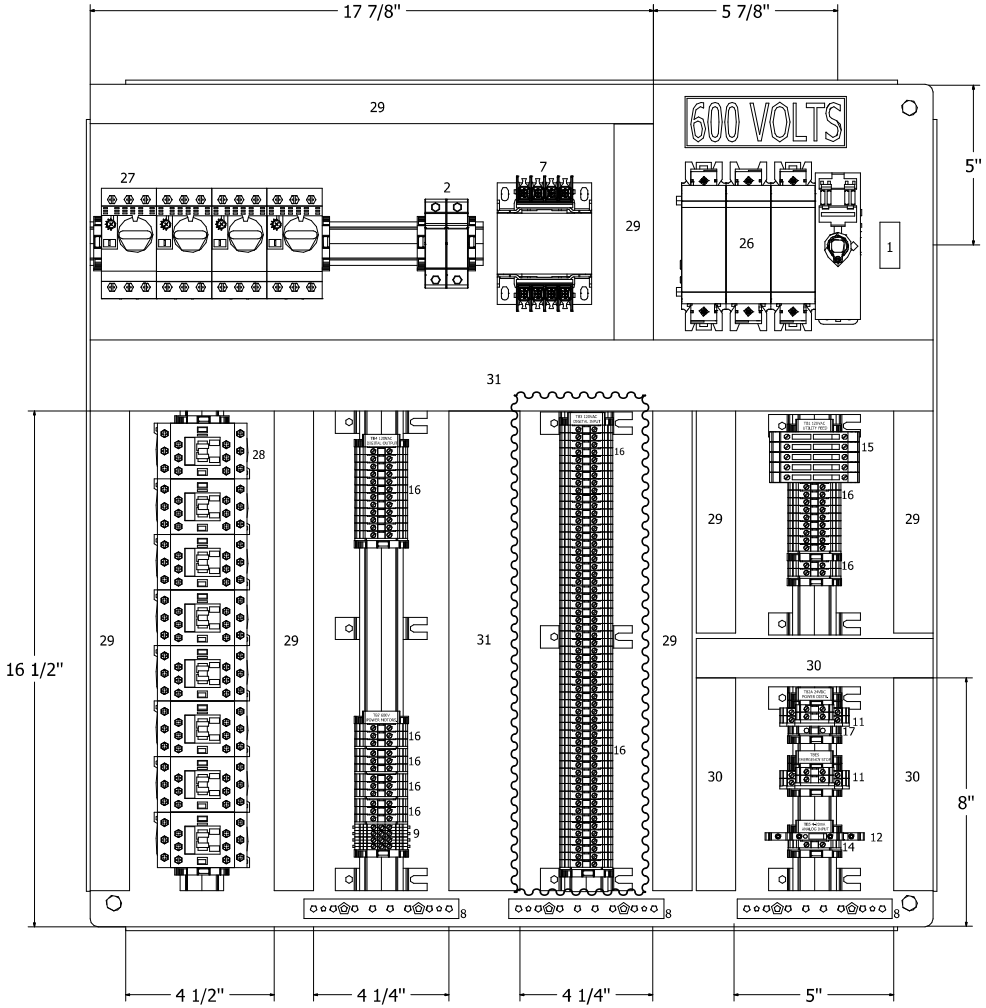


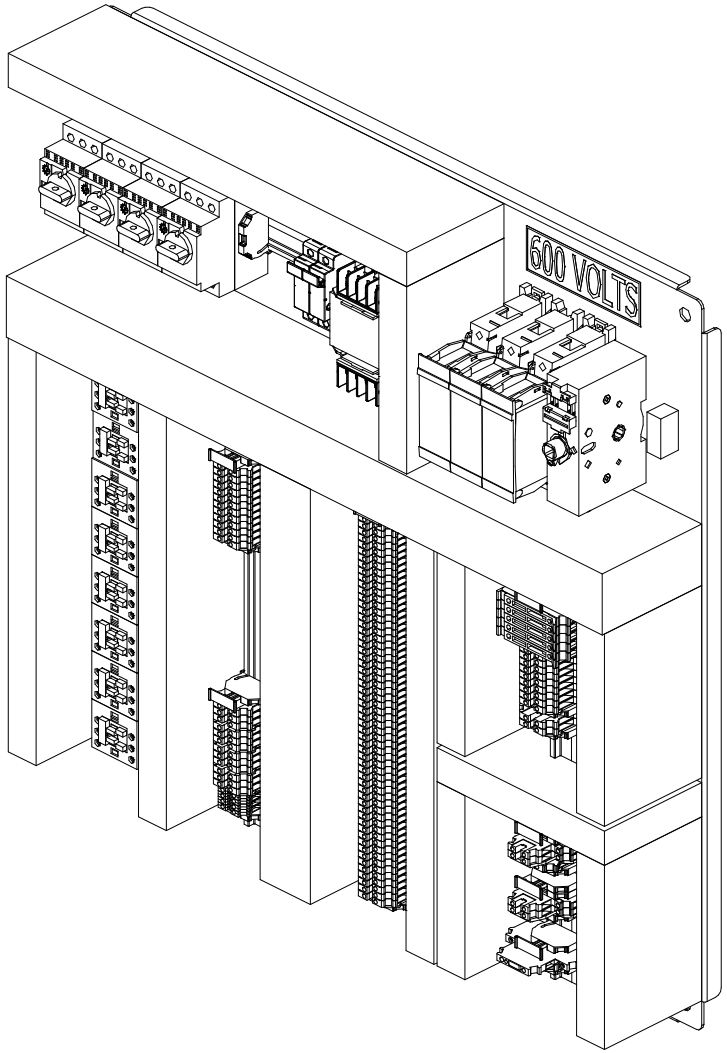


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## BILL OF MATERIALS

| ITEM # | QTY | DEVICE TAG | PART NUMBER | MANUFACTURER | DESCRIPTION | |
|---|---|---|---|---|---|---|
| 1 | 1 | GL-M31 | ADR21 | ABB | ALUMINUM GROUND LUG, 14-2/0AWG | DATASHEET |
| 2 | 1 | FU-TXM31 | CHCC2DU | BUSSMANN | 2 POLE FUSE HOLDER, CLASS CC, 30A | DATASHEET |
| | 4 | FU-TXM31 | LP-CC-1-1/2 | BUSSMANN | FUSE CLASS CC, TIME DELAY - 1-1/2A | DATASHEET |
| 3 | 1 | N/A | ECD18 | CROUSE-HINDS | COMBINATION DRAIN OR BREATHER, 1/2" MALE THREAD, STAINLESS STEEL | DATASHEET |
| | 6 | DS-M31 | JDL15 | EDISON | TIME DELAY FUSE - CLASS J - 15A | DATASHEET |
| | 2 | TB1 | GGM1 | FERRAZ | FAST ACTING GLASS FUSE 1A | DATASHEET |
| | 8 | TB1 | GGM1/2 | FERRAZ | FAST ACTING GLASS FUSE 1/2A | DATASHEET |
| 4 | 1 | N/A | A30H3008SSLP3PT | HOFFMAN | WALL MOUNT ENCLOSURE, CONTINUOUS HINGE, 3-POINT LATCH, NEMA4X, SS304, 30X30X8" | DATASHEET |
| 5 | 1 | N/A | A30P30 | HOFFMAN | MOUNTING PANEL, WHITE PAINTED STEEL, 30X30" | DATASHEET |
| 6 | 1 | N/A | AGS808 | HOFFMAN | GROUNDING STRAP | DATASHEET |
| 4 | 1 | N/A | AHCI10E | HOFFMAN | CORROSION INHIBITORS EMITTER PROTECTS, 10 CUBIC FEET | DATASHEET |
| 7 | 1 | TX-M31 | SP150ACP | HPS | TRANSFORMER 480-600VAC/120-240VAC, 150VA | DATASHEET |
| | 2 | TX-M31 | SPFG1 | HPS | FINGER GUARD FOR TRANSFORMER | DATASHEET |
| 8 | 3 | N/A | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 9 | 4 | TB7 | 0443081 | PHOENIX CONTACT | SINGLE-LEVEL GROUNDING TERMINAL BLOCK, SCREW, GREEN/YELLOW | DATASHEET |
| 10 | 2 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 11 | 4 | TB2A;TBES | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 12 | 1 | TB5 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 13 | 10 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 14 | 1 | TB5 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 15 | 5 | TB1 | 3004142 | PHOENIX CONTACT | 120VAC FUSE TERMINAL BLOCK, TYPE, SCREW, 6.3A, 24-12AWG, BLACK | DATASHEET |
| 16 | 93 | TB1;TB3;TB4;TB7 | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |

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| ITEM # | QTY | DEVICE TAG | PART NUMBER | MANUFACTURER | DESCRIPTION | |
|---|---|---|---|---|---|---|
| 17 | 1 | TB2A | 3004388 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, BLU | DATASHEET |
| 18 | 12 | PB-M3100A;PB-M3100B;PB-M3100C;PB-M3100D;SS1-M3100A;SS1-M3100B;SS1-M3100C;SS1-M3100D | 9001KA2 | SCHNEIDER ELECTRIC | SINGLE N.O. CONTACT BLOCK, 30MM | DATASHEET |
| 19 | 1 | PB-ES-CP-M31 | 9001KA3 | SCHNEIDER ELECTRIC | SINGLE N.C. CONTACT BLOCK, 30.5MM | DATASHEET |
| 20 | 1 | PB-ES-CP-M31 | 9001KN9330 | SCHNEIDER ELECTRIC | EMERGENCY STOP LEGEND PLATE, YELLOW, 60MM ROUND, 30.5MM MOUNTING HOLE, ENGLISH DESCRIPTION | DATASHEET |
| 21 | 4 | SS1-M3100A;SS1-M3100B;SS1-M3100C;SS1-M3100D | 9001SK11J38GH1 | SCHNEIDER ELECTRIC | SELECTOR SWITCH, 2-POSITIONS, MAINTAINED,GREEN, 30MM | DATASHEET |
| 22 | 4 | LT-M3100A;LT-M3100B;LT-M3100C;LT-M3100D | 9001SKP38LYA9 | SCHNEIDER ELECTRIC | PILOT LIGHT 120V AC/DC, AMBER, NEMA 4X, 30MM | DATASHEET |
| 23 | 4 | PB-M3100A;PB-M3100B;PB-M3100C;PB-M3100D | 9001SKR1U | SCHNEIDER ELECTRIC | PLASTIC PUSH BUTTON 30MM, 7 COLOURED CAPS | DATASHEET |
| 24 | 1 | PB-ES-CP-M31 | 9001SKR16H2 | SCHNEIDER ELECTRIC | NON-ILLUMINATED EMERGENCY STOP BUTTON, MUSHROOM MAINTAINED, TURN TO RELEASE (2 NO + 2 NC) | DATASHEET |
| | 1 | DS-M31 | GS2AE2 | SCHNEIDER ELECTRIC | 12.6-INCH OPERATING SHAFT, FOR GS SWITCHES 50-400A & LK SWITCHES 100-400A | DATASHEET |
| 25 | 1 | DS-M31 | GS2AH440 | SCHNEIDER ELECTRIC | GS2 PADLOCKABLE HANDLE NEMA 4X RED/YELLOW, 100-400A | DATASHEET |
| 26 | 1 | DS-M31 | GS2EU3N | SCHNEIDER ELECTRIC | GS2 FUSE DISCONNECT SWITCH, 30A, FUSE TYPE J, 3POLE | DATASHEET |
| 27 | 4 | MMS-M3100A;MMS-M3100B;MMS-M3100C;MMS-M3100D | GV2P05 | SCHNEIDER ELECTRIC | THERMAL MAGNETIC MOTOR CIRCUIT BREAKER - TESYS GV2P SERIES - 3P - 0.63...1A | DATASHEET |
| | 4 | C-M3100AF;C-M3100BF;C-M3100CF;C-M3100DF | LAD9R1 | SCHNEIDER ELECTRIC | KIT FOR ASSEMBLING 3P REVERSING CONTACTOR, LC1D09 | DATASHEET |
| 28 | 8 | C-M3100AF;C-M3100AR;C-M3100BF;C-M3100BR;C-M3100CF;C-M3100CR;C-M3100DF;C-M3100DR | LC1D09G7 | SCHNEIDER ELECTRIC | 3-POLE CONTACTOR - TESYS D SERIES - 9A AC-3, 20A AC-1, 5HP AT 480V, 7.5HP AT 600V, COIL 120VAC | DATASHEET |
| 29 | 7 | N/A | TYD1X4NPG6 | THOMAS & BETTS | WIRING DUCT 1X4", GRAY | DATASHEET |
| 30 | 3 | N/A | TYD1X4NPW6 | THOMAS & BETTS | WIRING DUCT 1X4", WHITE | DATASHEET |
| 31 | 2 | N/A | TYD2X4NPG6 | THOMAS & BETTS | WIRING DUCT 2X4", GRAY | DATASHEET |
| 32 | 10 | N/A | CA803 | TECHSPAN | DIN RAIL ELEVATION MOUNTING BRACKET - 2" | DATASHEET |
| 33 | 6 | N/A | DRS35X7.5S | TECHSPAN | DIN MOUNTING RAIL, ZINC | DATASHEET |
| 34 | 23 | N/A | 249-116 | WAGO | SCREWLESS END STOP | DATASHEET |

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## BILL OF MATERIALS

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|---|---|---|---|---|---|---|
| 35 | 7 | N/A | 249-119 | WAGO | ADJUSTABLE GROUP MARKER CARRIER | DATASHEET |

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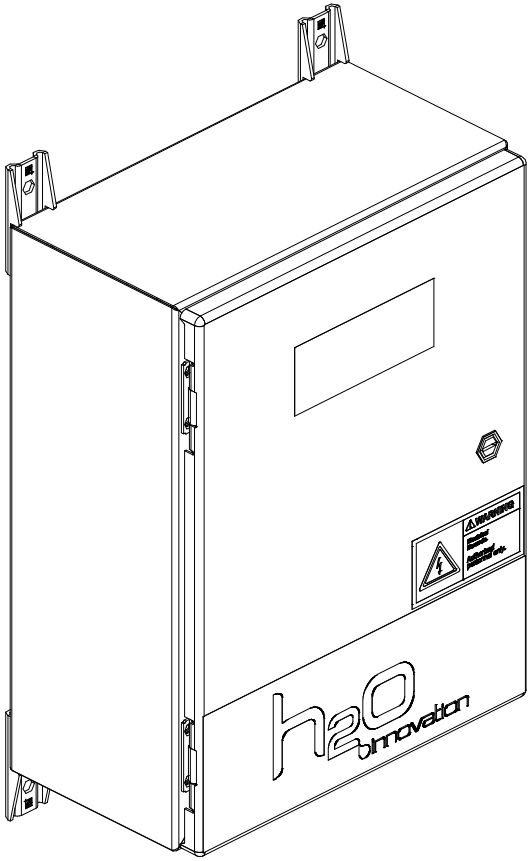


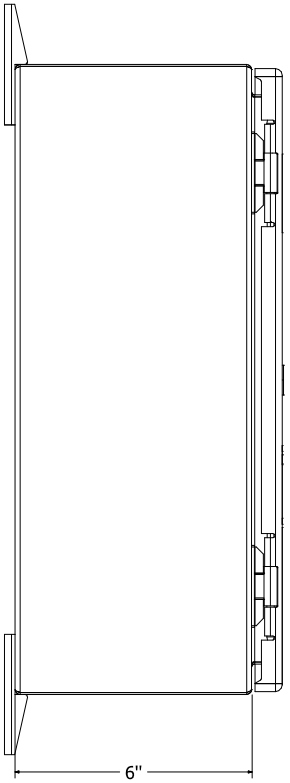


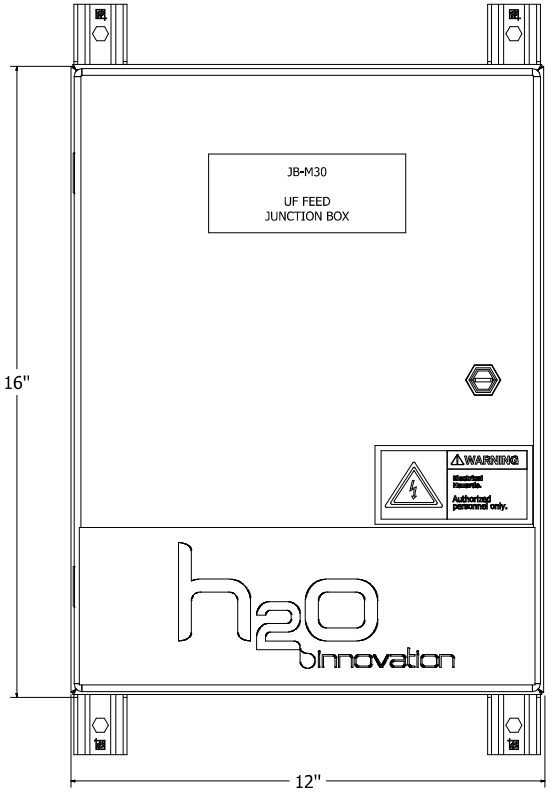


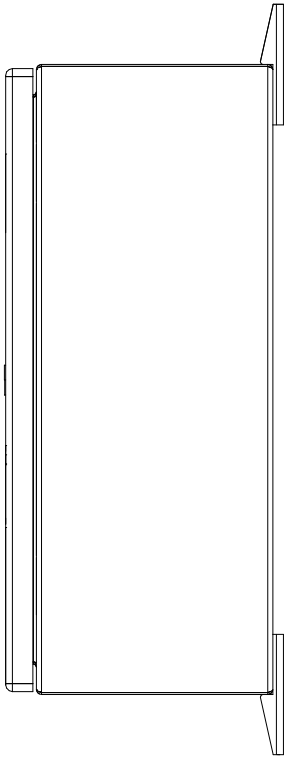

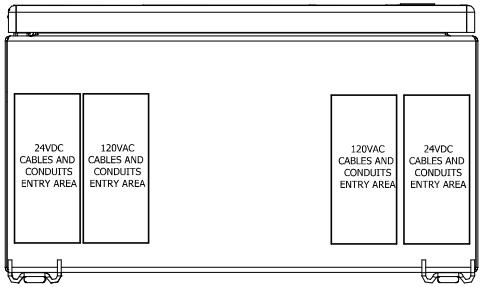


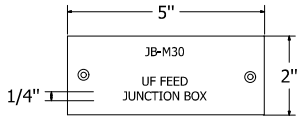


- ADHESIVE BACKED LAMINATED PLASTIC FASTENED WITH STAINLESS STEEL RIVETS
- BLACK ENGRAVED LETTERING ON WHITE BACKGROUND
- THICKNESS 1/16"

NOTE 1: THE JUNCTION BOX WILL BE SHIPPED LOOSE

NOTE 2: ALL CONNECTIONS WILL BE THROUGH THE BOTTOM

NOTE 3: PANEL WEIGHT: APPROX. 25 LBS

NOTE 4: INDUSTRIAL CONTROL PANEL, US AND CANADA (UL 508A), NITW, NITW7

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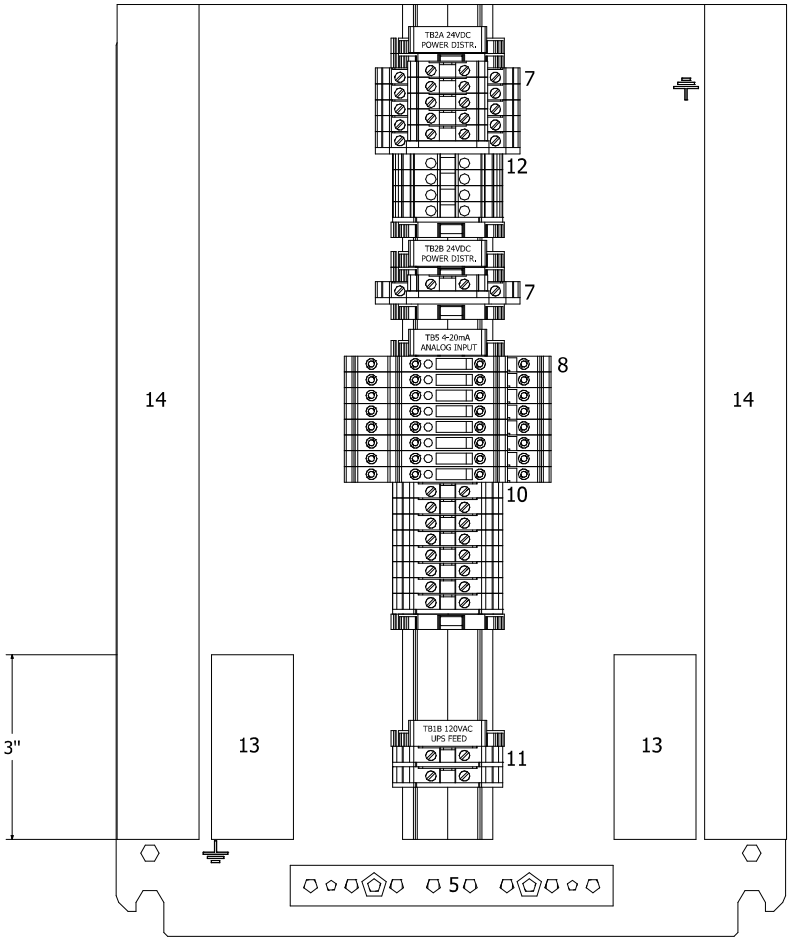


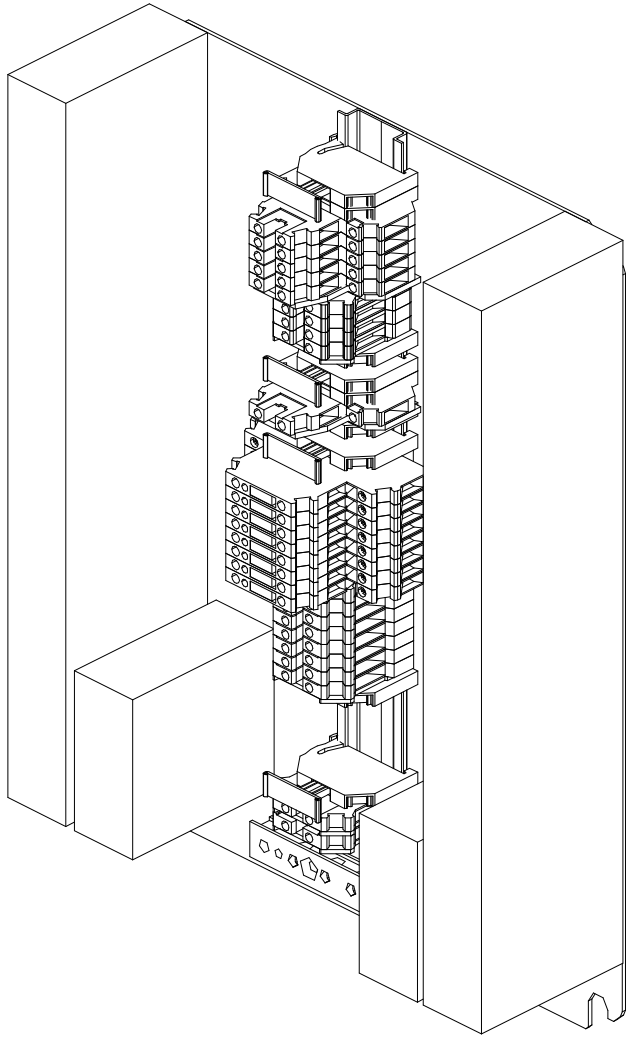

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|---|---|---|---|---|---|---|
| 1 | 1 | N/A | AGS808 | HOFFMAN | GROUNDING STRAP | DATASHEET |
| 2 | 1 | N/A | CMFKSS | HOFFMAN | STAINLESS STEEL MOUNTING FOOT | DATASHEET |
| 3 | 1 | N/A | CP1612 | HOFFMAN | BACKPLATE PAINTED STEEL 16X12" | DATASHEET |
| 4 | 1 | N/A | CSD16126SS | HOFFMAN | WALL MOUNT ENCLOSURE, CONCEPT SERIES, QUARTER-TURN LATCH, NEMA4X, SS304, 16X12X6" | DATASHEET |
| 5 | 1 | N/A | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 6 | 2 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 7 | 6 | TB2A;TB2B | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 8 | 8 | TB5 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 9 | 4 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 10 | 8 | TB5 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 11 | 2 | TB1B | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |
| 12 | 4 | TB2A | 3004388 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, BLU | DATASHEET |
| 13 | 2 | N/A | TYD1X3NPG6 | THOMAS & BETTS | WIRING DUCT 1X3", GRAY | DATASHEET |
| 14 | 2 | N/A | TYD1X3NPW6 | THOMAS & BETTS | WIRING DUCT 1X3", WHITE | DATASHEET |
| 15 | 1 | N/A | DRS35X7.5S | TECHSPAN | DIN MOUNTING RAIL, ZINC | DATASHEET |
| 16 | 9 | N/A | 249-116 | WAGO | SCREWLESS END STOP | DATASHEET |
| 17 | 4 | N/A | 249-119 | WAGO | ADJUSTABLE GROUP MARKER CARRIER | DATASHEET |

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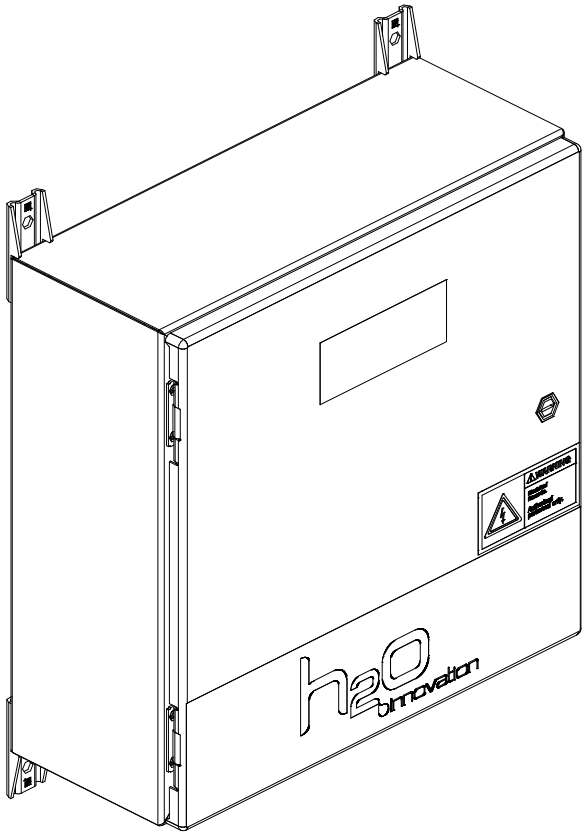


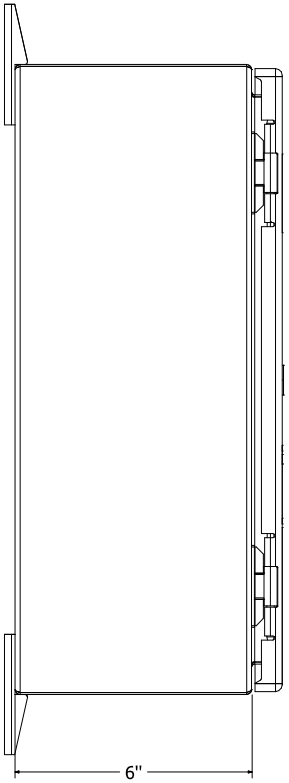


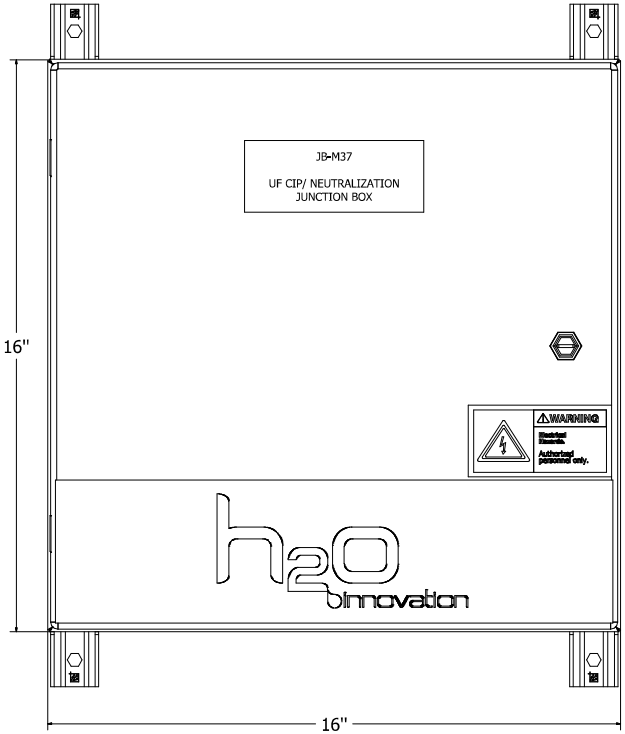


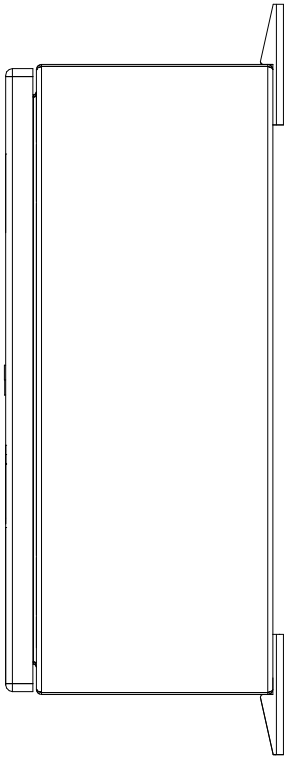

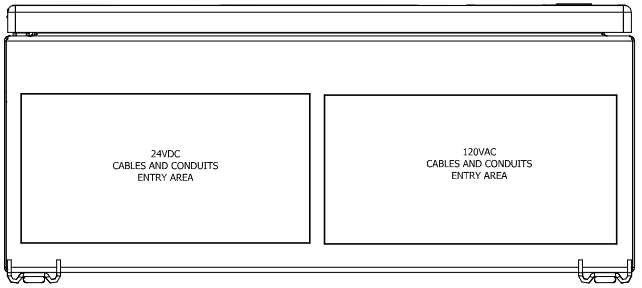


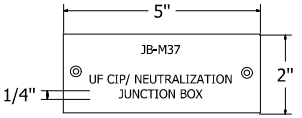


- ADHESIVE BACKED LAMINATED PLASTIC FASTENED WITH STAINLESS STEEL RIVETS
- BLACK ENGRAVED LETTERING ON WHITE BACKGROUND
- THICKNESS 1/16"

NOTE 1: THE JUNCTION BOX WILL BE SHIPPED LOOSE

NOTE 2: ALL CONNECTIONS WILL BE THROUGH THE BOTTOM

NOTE 3: PANEL WEIGHT: APPROX. 25 LBS

NOTE 4: INDUSTRIAL CONTROL PANEL, US AND CANADA (UL 508A), NITW, NITW7

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OF 64
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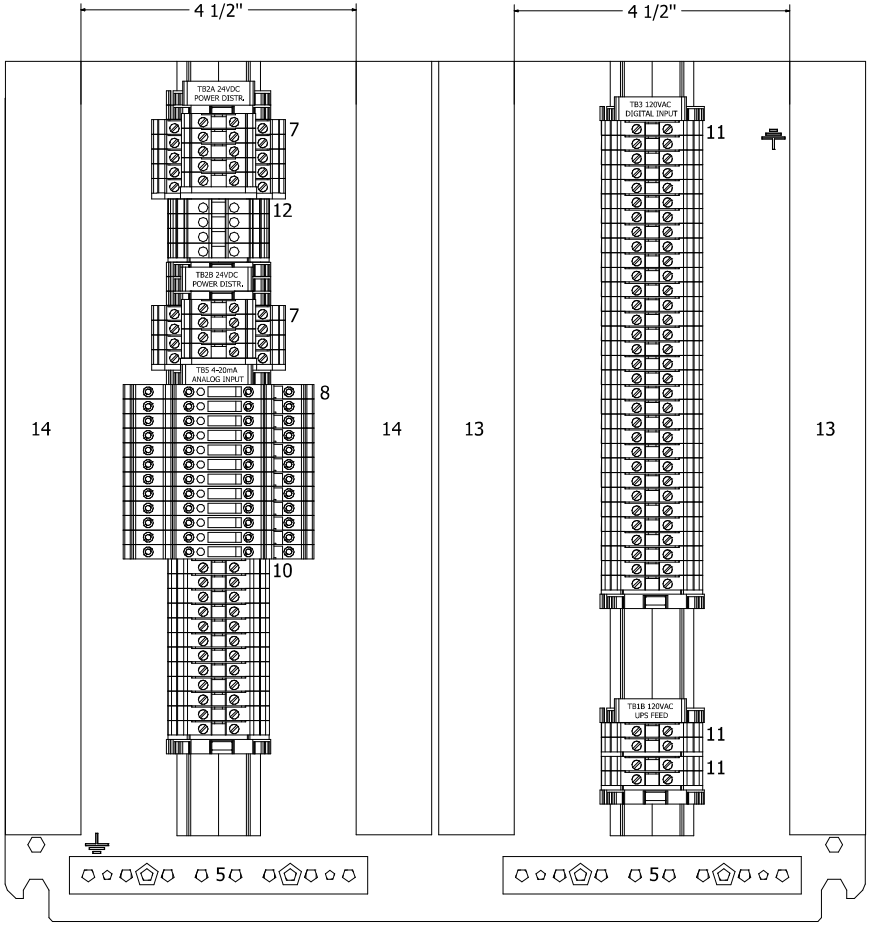


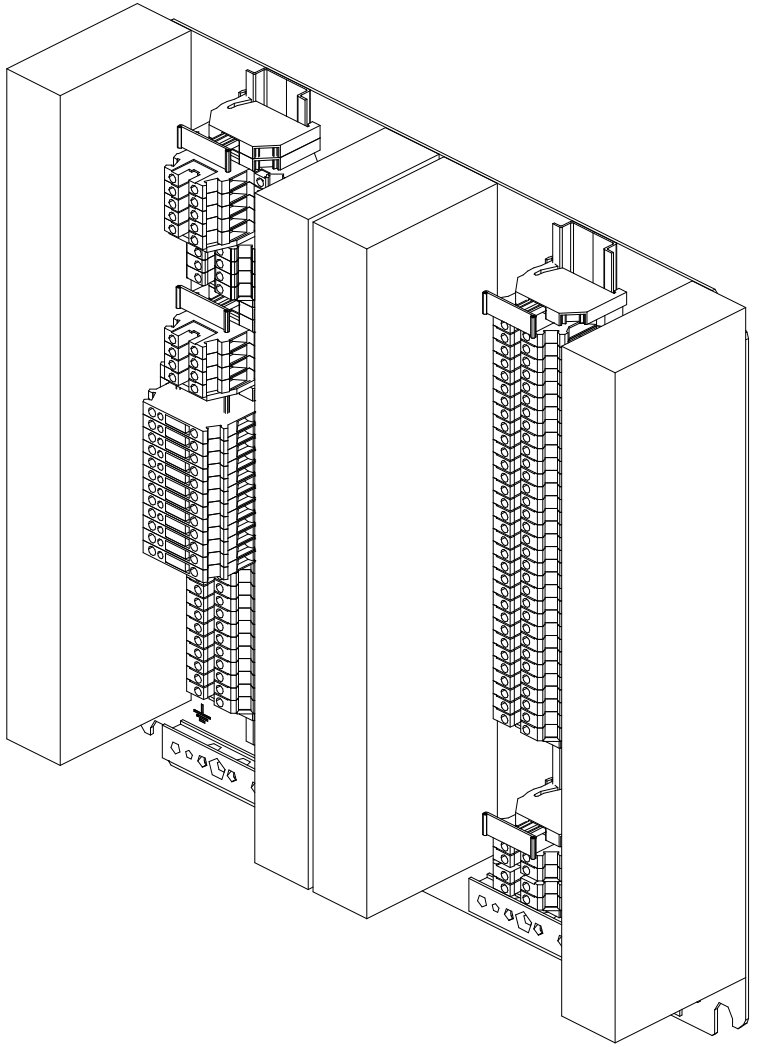

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## BILL OF MATERIALS

| ITEM # | QTY | DEVICE TAG | PART NUMBER | MANUFACTURER | DESCRIPTION | |
|---|---|---|---|---|---|---|
| 1 | 1 | N/A | AGS808 | HOFFMAN | GROUNDING STRAP | DATASHEET |
| 2 | 1 | N/A | CMFKSS | HOFFMAN | STAINLESS STEEL MOUNTING FOOT | DATASHEET |
| 3 | 1 | N/A | CP1616 | HOFFMAN | BACKPLATE PAINTED STEEL 16X16" | DATASHEET |
| 4 | 1 | N/A | CSD16166SS | HOFFMAN | WALL MOUNT ENCLOSURE, CONCEPT SERIES, QUARTER-TURN LATCH, NEMA4X, SS304, 16X16X6" | DATASHEET |
| 5 | 2 | N/A | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 6 | 2 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 7 | 9 | TB2A;TB2B | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 8 | 12 | TB5 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 9 | 5 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 10 | 12 | TB5 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 11 | 36 | TB1B;TB3 | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |
| 12 | 4 | TB2A | 3004388 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, BLU | DATASHEET |
| 13 | 2 | N/A | TYD1X3NPG6 | THOMAS & BETTS | WIRING DUCT 1X3", GRAY | DATASHEET |
| 14 | 2 | N/A | TYD1X3NPW6 | THOMAS & BETTS | WIRING DUCT 1X3", WHITE | DATASHEET |
| 15 | 2 | N/A | DRS35X7.5S | TECHSPAN | DIN MOUNTING RAIL, ZINC | DATASHEET |
| 16 | 11 | N/A | 249-116 | WAGO | SCREWLESS END STOP | DATASHEET |
| 17 | 5 | N/A | 249-119 | WAGO | ADJUSTABLE GROUP MARKER CARRIER | DATASHEET |

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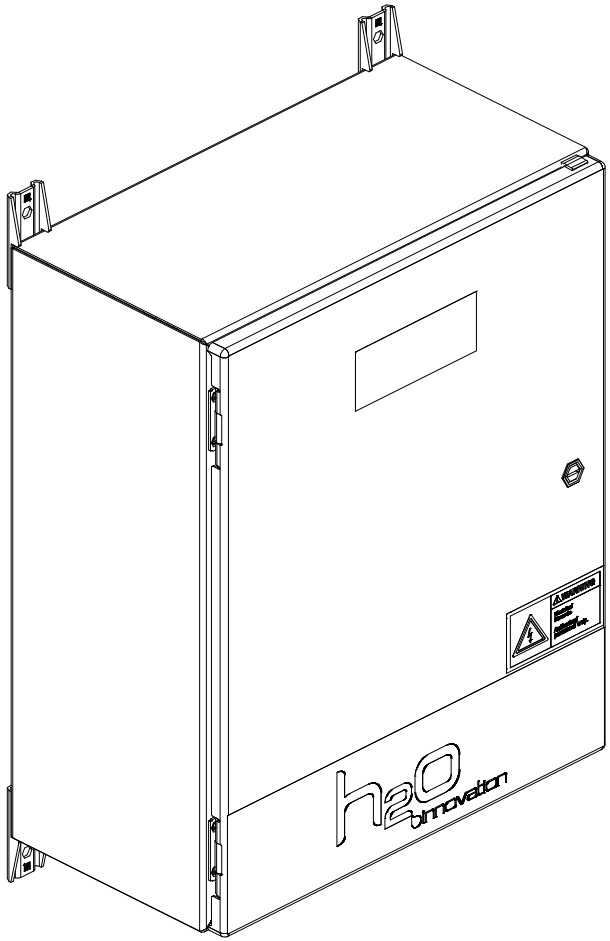

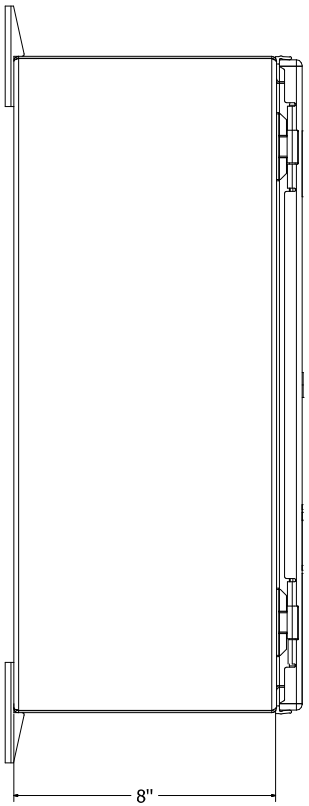


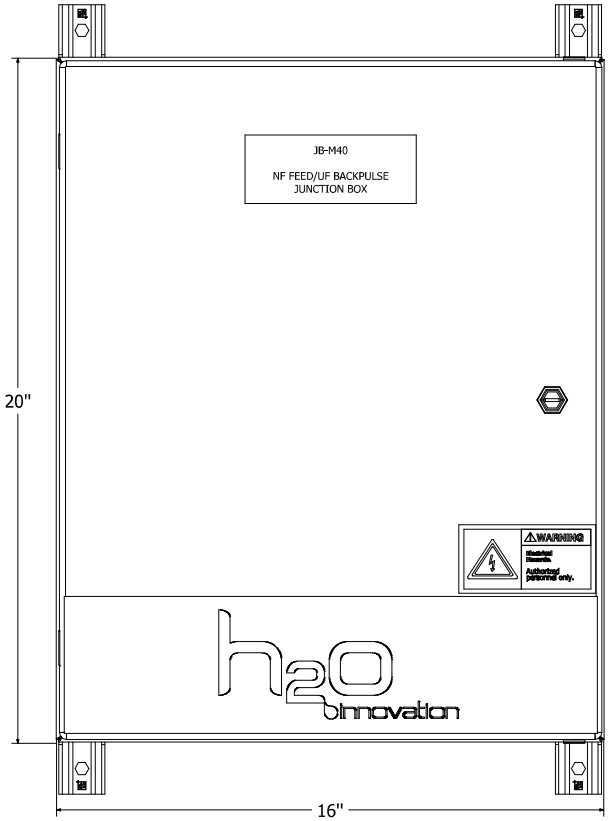


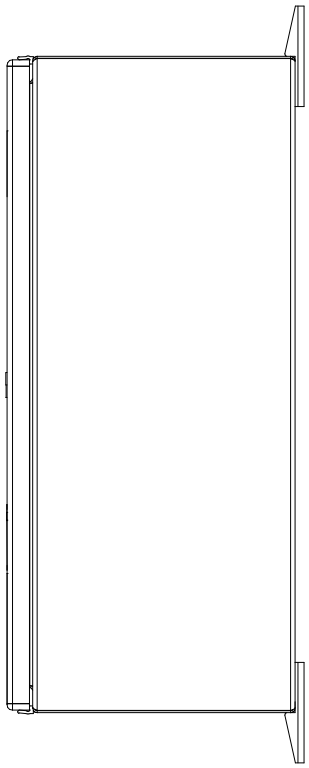

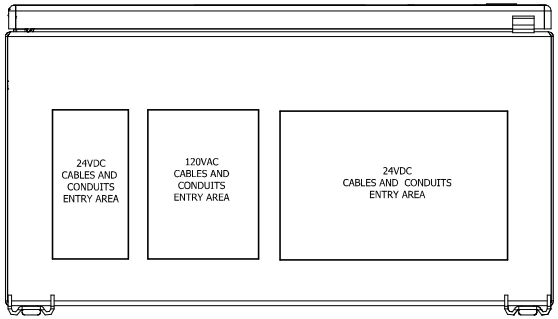


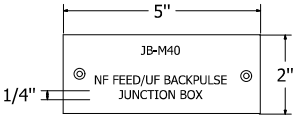


- ADHESIVE BACKED LAMINATED PLASTIC FASTENED WITH STAINLESS STEEL RIVETS
- BLACK ENGRAVED LETTERING ON WHITE BACKGROUND
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NOTE 4: INDUSTRIAL CONTROL PANEL, US AND CANADA (UL 508A), NITW, NITW7

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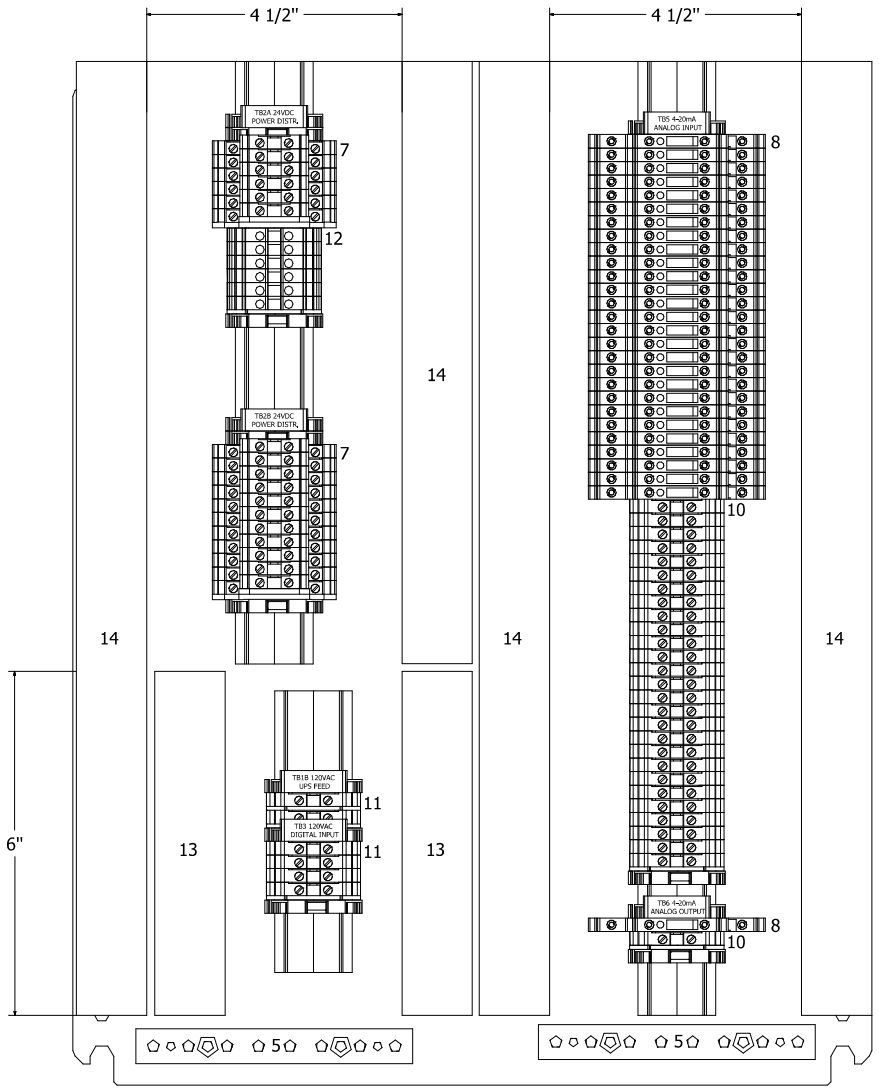


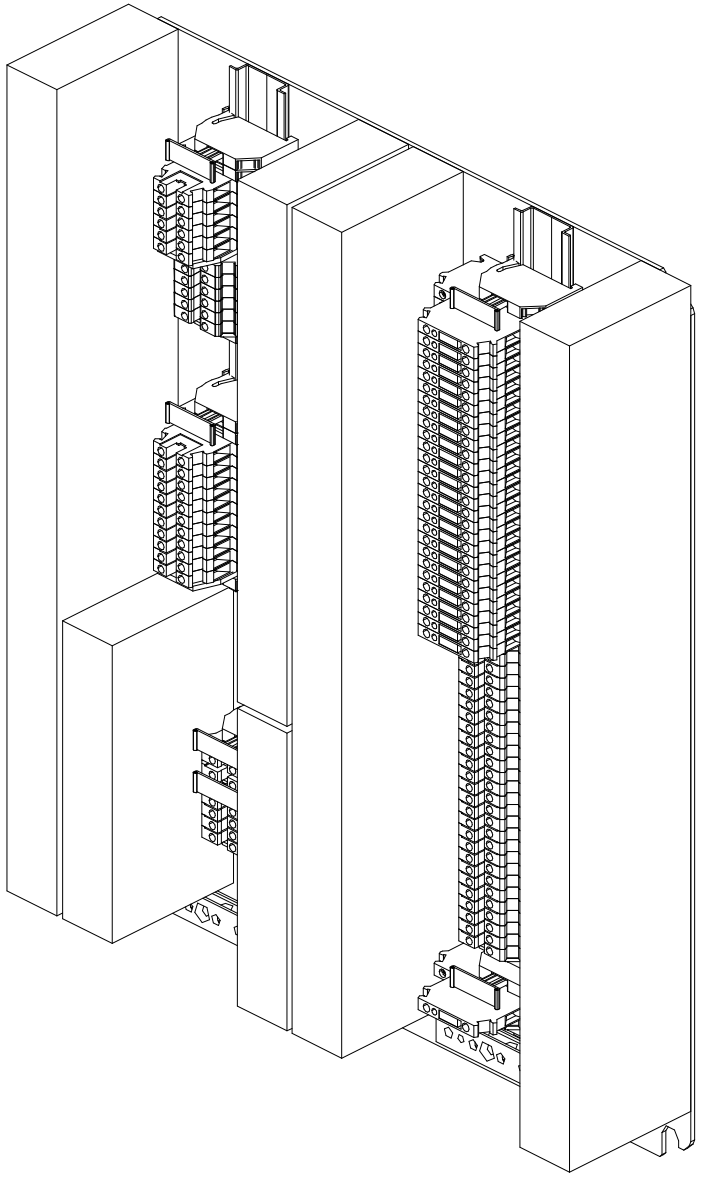

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|---|---|---|---|---|---|---|
| 1 | 1 | N/A | AGS808 | HOFFMAN | GROUNDING STRAP | DATASHEET |
| 2 | 1 | N/A | CMFKSS | HOFFMAN | STAINLESS STEEL MOUNTING FOOT | DATASHEET |
| 3 | 1 | N/A | CP2016 | HOFFMAN | BACKPLATE PAINTED STEEL 20X16" | DATASHEET |
| 4 | 1 | N/A | CSD20168SS | HOFFMAN | WALL MOUNT ENCLOSURE, CONCEPT SERIES, QUARTER-TURN LATCH, NEMA4X, SS304, 20X16X8" | DATASHEET |
| 5 | 2 | N/A | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 6 | 2 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 7 | 17 | TB2A;TB2B | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 8 | 28 | TB5;TB6 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 9 | 6 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 10 | 28 | TB5;TB6 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 11 | 6 | TB1B;TB3 | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |
| 12 | 6 | TB2A | 3004388 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, BLU | DATASHEET |
| 13 | 2 | N/A | TYD1X3NPG6 | THOMAS & BETTS | WIRING DUCT 1X3", GRAY | DATASHEET |
| 14 | 4 | N/A | TYD1X3NPW6 | THOMAS & BETTS | WIRING DUCT 1X3", WHITE | DATASHEET |
| 15 | 3 | N/A | DRS35X7.5S | TECHSPAN | DIN MOUNTING RAIL, ZINC | DATASHEET |
| 16 | 13 | N/A | 249-116 | WAGO | SCREWLESS END STOP | DATASHEET |
| 17 | 6 | N/A | 249-119 | WAGO | ADJUSTABLE GROUP MARKER CARRIER | DATASHEET |

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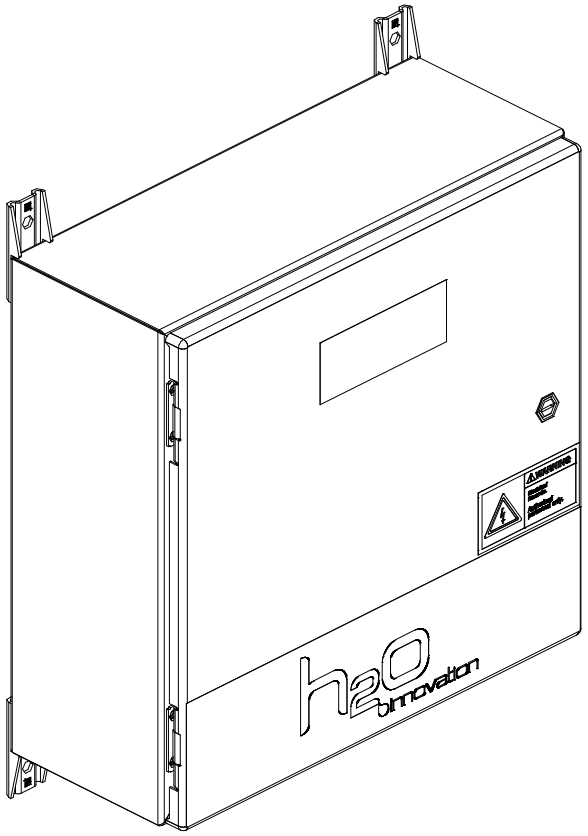


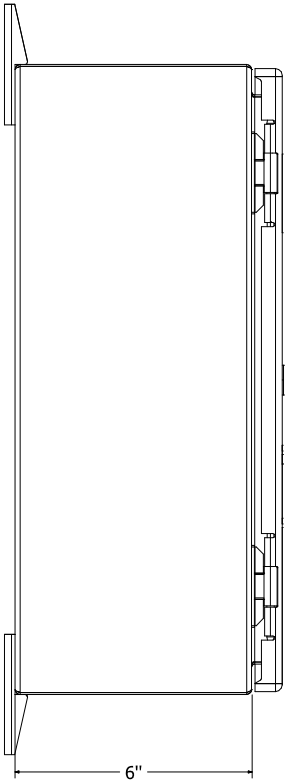


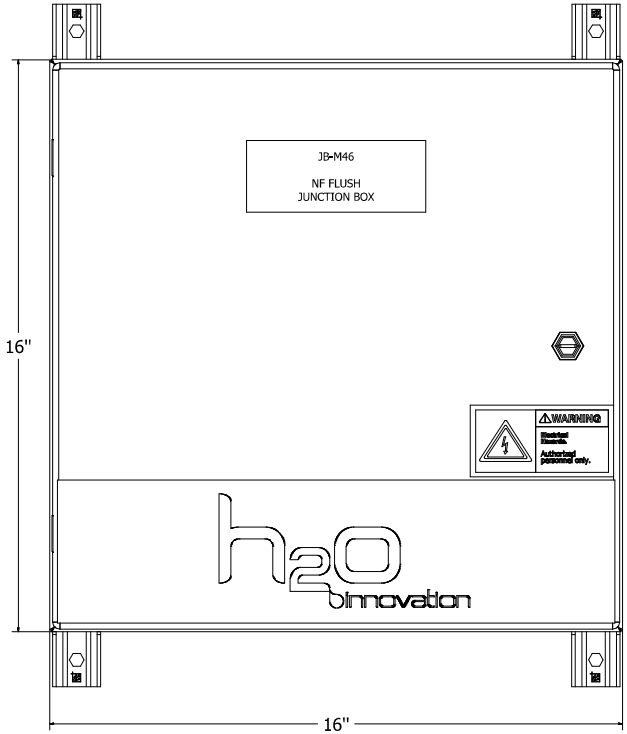


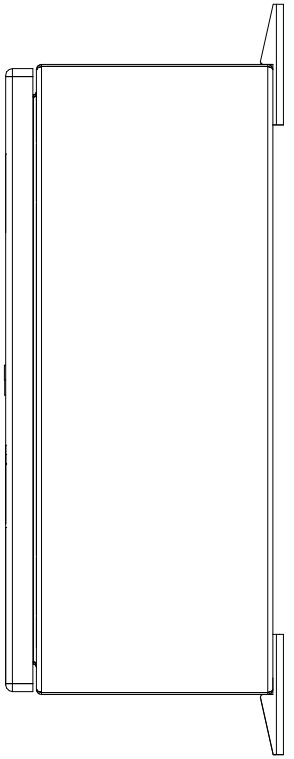

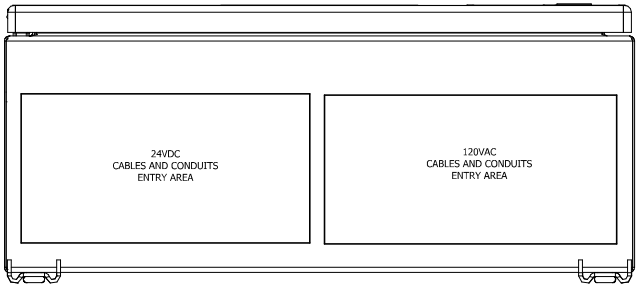


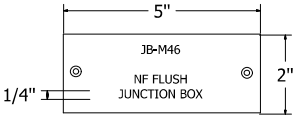


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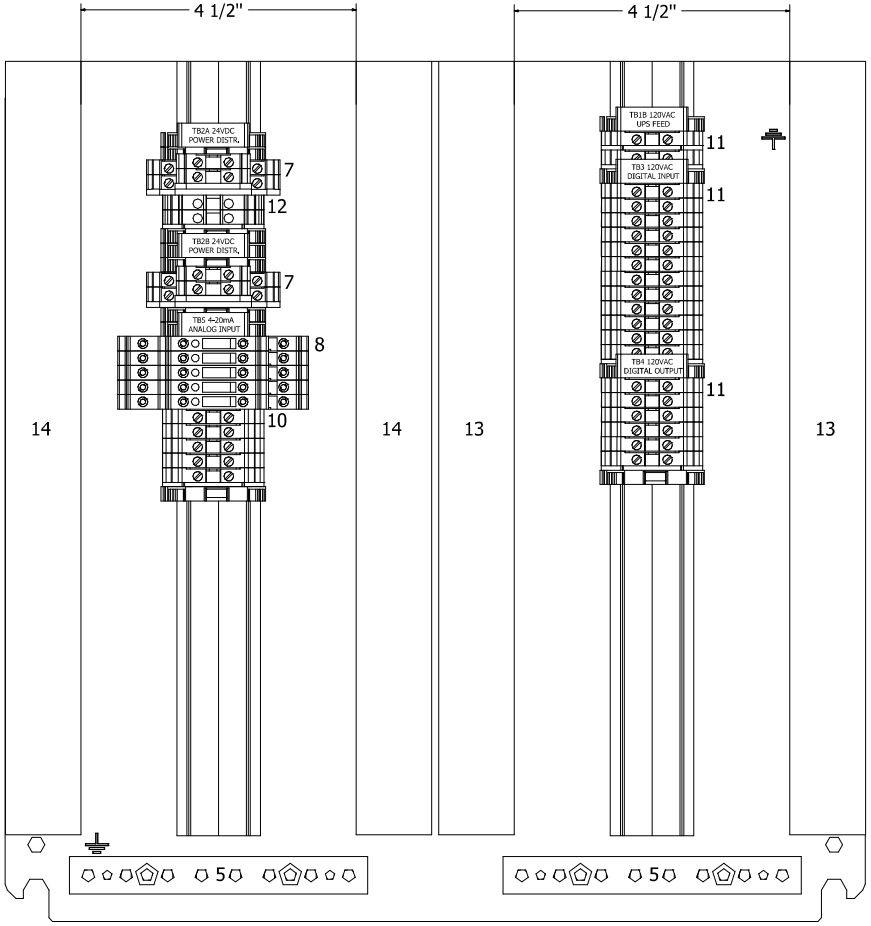


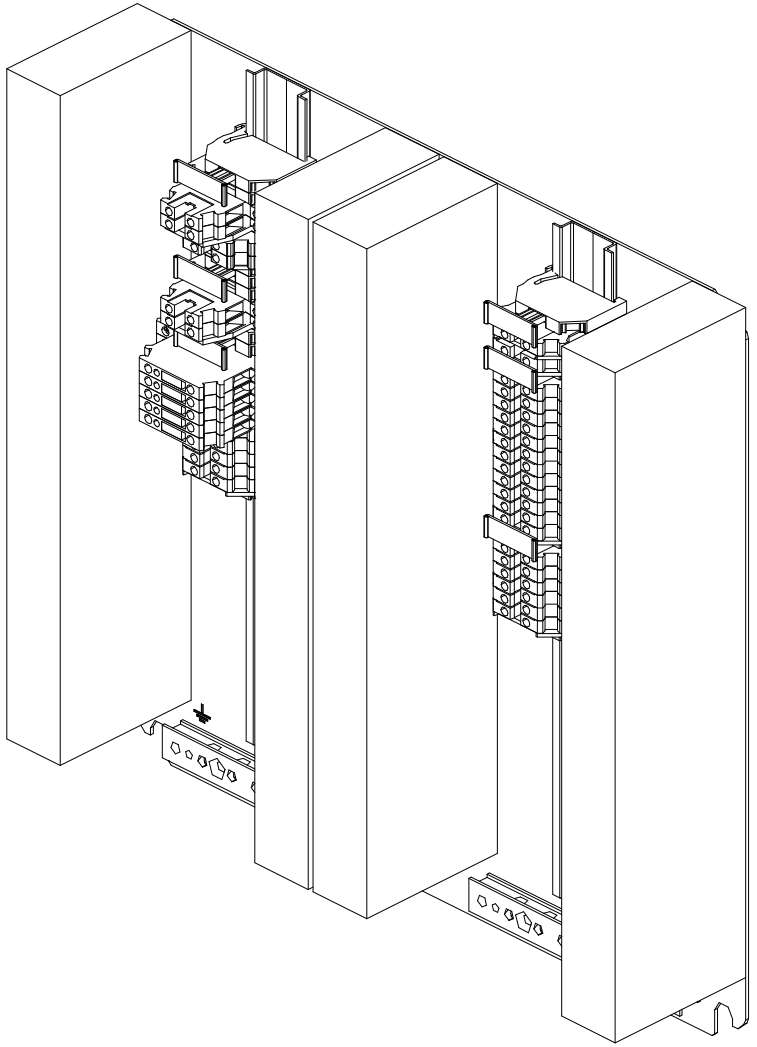

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| 3 | 1 | N/A | CP1616 | HOFFMAN | BACKPLATE PAINTED STEEL 16X16" | DATASHEET |
| 4 | 1 | N/A | CSD16166SS | HOFFMAN | WALL MOUNT ENCLOSURE, CONCEPT SERIES, QUARTER-TURN LATCH, NEMA4X, SS304, 16X16X6" | DATASHEET |
| 5 | 2 | N/A | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 6 | 2 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 7 | 4 | TB2A;TB2B | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 8 | 5 | TB5 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 9 | 6 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 10 | 5 | TB5 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 11 | 20 | TB1B;TB3;TB4 | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |
| 12 | 2 | TB2A | 3004388 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, BLU | DATASHEET |
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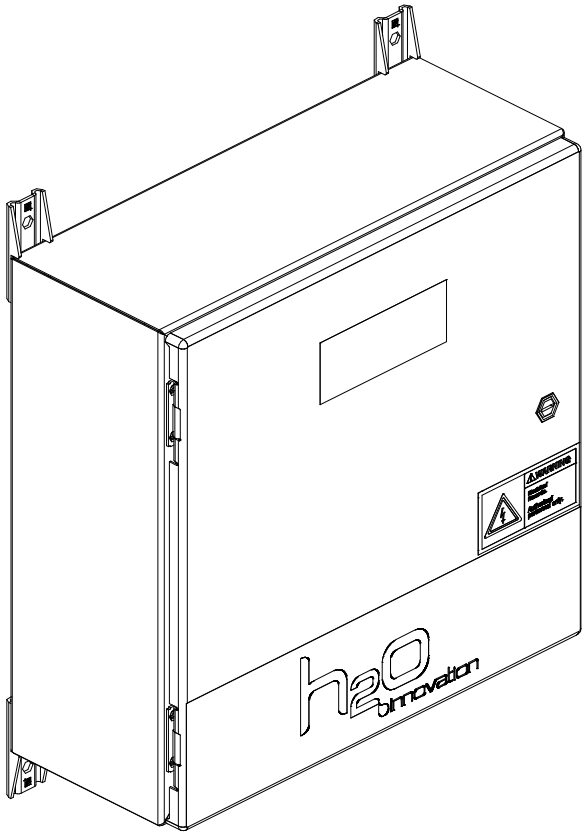

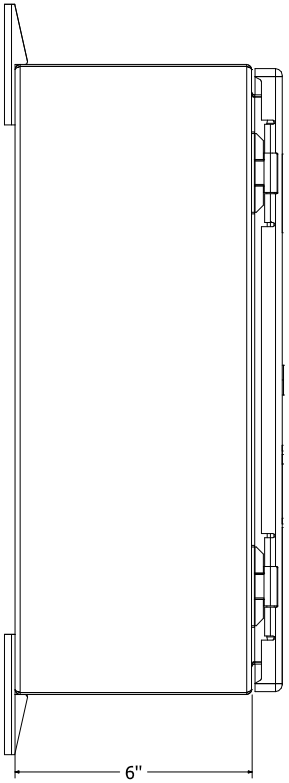


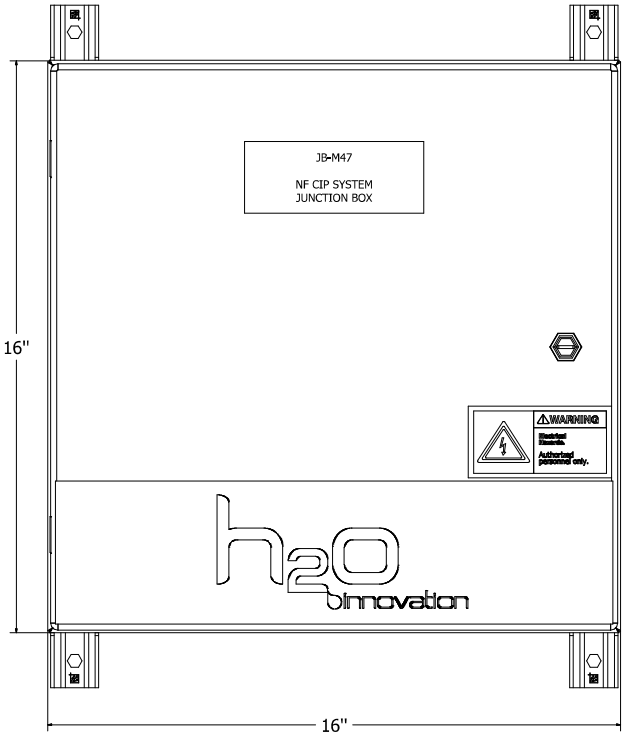


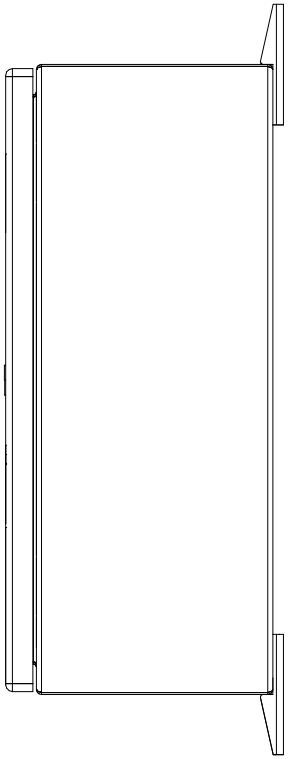

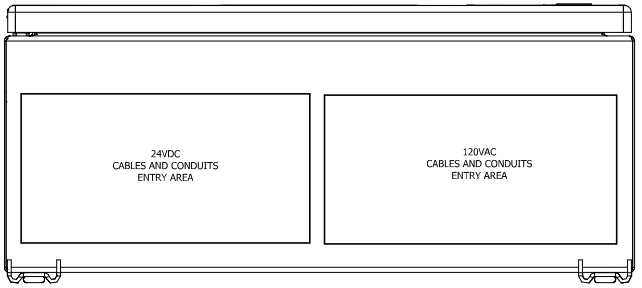


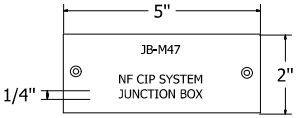


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- BLACK ENGRAVED LETTERING ON WHITE BACKGROUND
- THICKNESS 1/16"

NOTE 1: THE JUNCTION BOX WILL BE SHIPPED LOOSE

NOTE 2: ALL CONNECTIONS WILL BE THROUGH THE BOTTOM

NOTE 3: PANEL WEIGHT: APPROX. 25 LBS

NOTE 4: INDUSTRIAL CONTROL PANEL, US AND CANADA (UL 508A), NITW, NITW7

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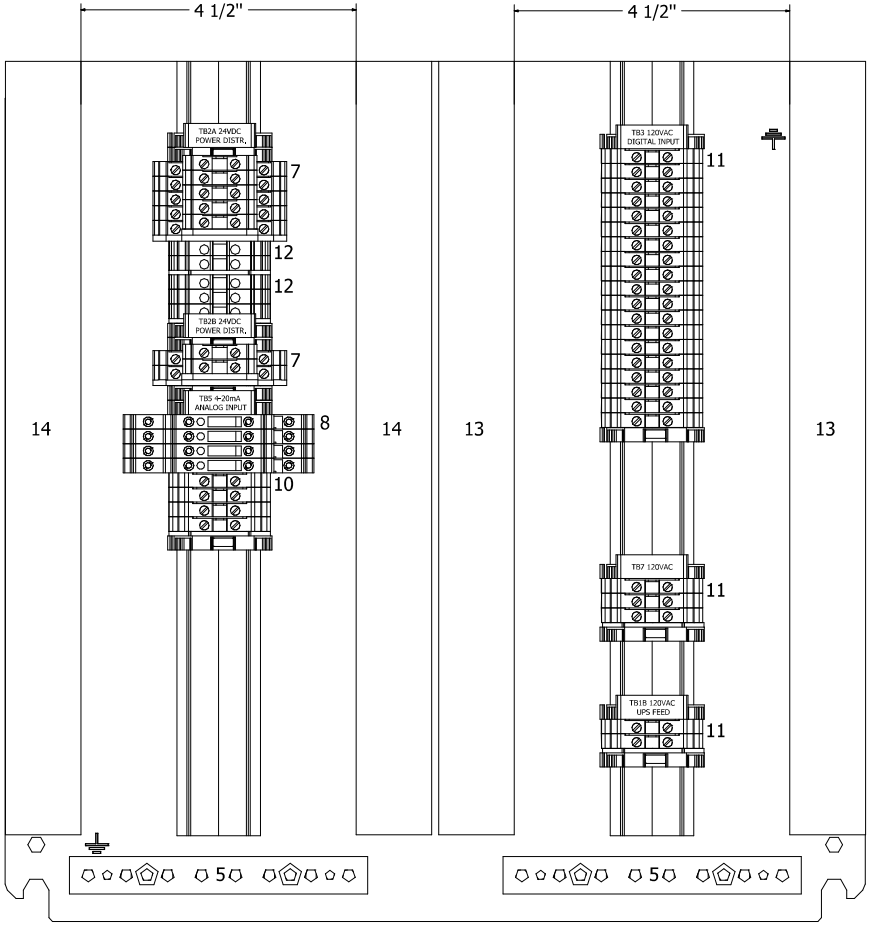
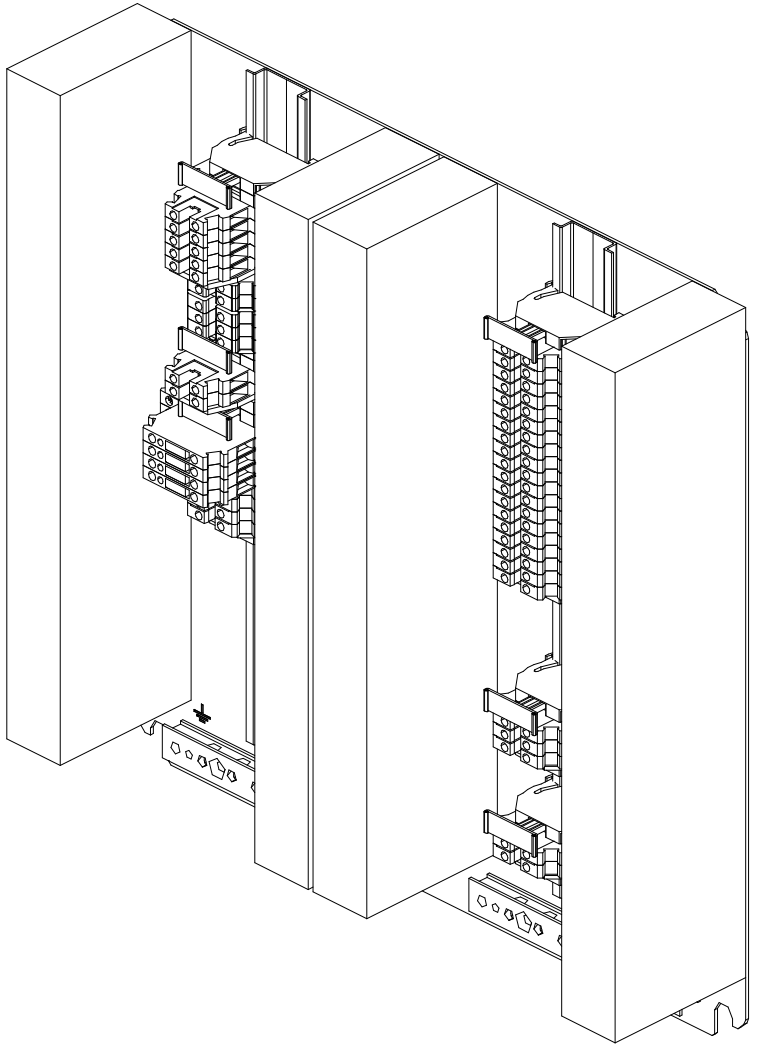
OF 64
REV 04



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## BILL OF MATERIALS

| ITEM # | QTY | DEVICE TAG | PART NUMBER | MANUFACTURER | DESCRIPTION | |
|---|---|---|---|---|---|---|
| 1 | 1 | N/A | AGS808 | HOFFMAN | GROUNDING STRAP | DATASHEET |
| 2 | 1 | N/A | CMFKSS | HOFFMAN | STAINLESS STEEL MOUNTING FOOT | DATASHEET |
| 3 | 1 | N/A | CP1616 | HOFFMAN | BACKPLATE PAINTED STEEL 16X16" | DATASHEET |
| 4 | 1 | N/A | CSD16166SS | HOFFMAN | WALL MOUNT ENCLOSURE, CONCEPT SERIES, QUARTER-TURN LATCH, NEMA4X, SS304, 16X16X6" | DATASHEET |
| 5 | 2 | N/A | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 6 | 2 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 7 | 7 | TB2A;TB2B | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 8 | 4 | TB5 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 9 | 5 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 10 | 4 | TB5 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 11 | 24 | TB1B;TB3;TB7 | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |
| 12 | 5 | TB2A | 3004388 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, BLU | DATASHEET |
| 13 | 2 | N/A | TYD1X3NPG6 | THOMAS & BETTS | WIRING DUCT 1X3", GRAY | DATASHEET |
| 14 | 2 | N/A | TYD1X3NPW6 | THOMAS & BETTS | WIRING DUCT 1X3", WHITE | DATASHEET |
| 15 | 2 | N/A | DRS35X7.5S | TECHSPAN | DIN MOUNTING RAIL, ZINC | DATASHEET |
| 16 | 13 | N/A | 249-116 | WAGO | SCREWLESS END STOP | DATASHEET |
| 17 | 6 | N/A | 249-119 | WAGO | ADJUSTABLE GROUP MARKER CARRIER | DATASHEET |

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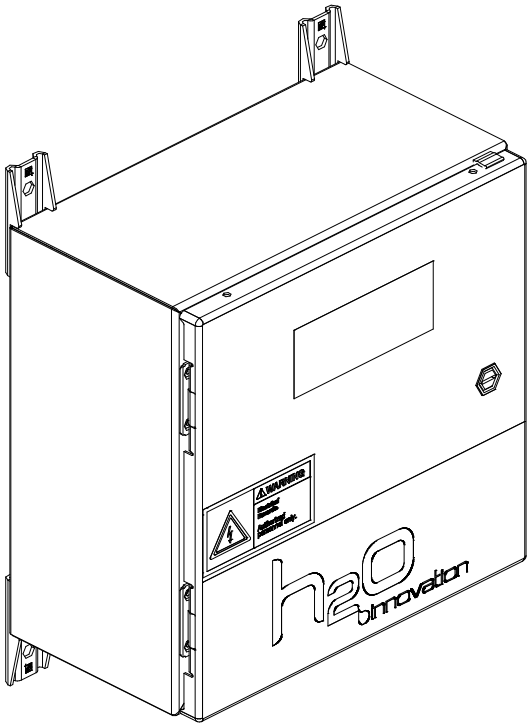


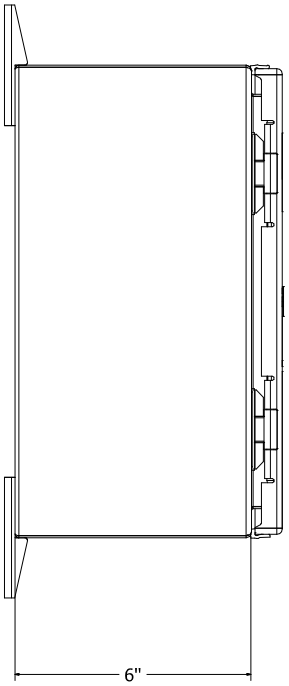


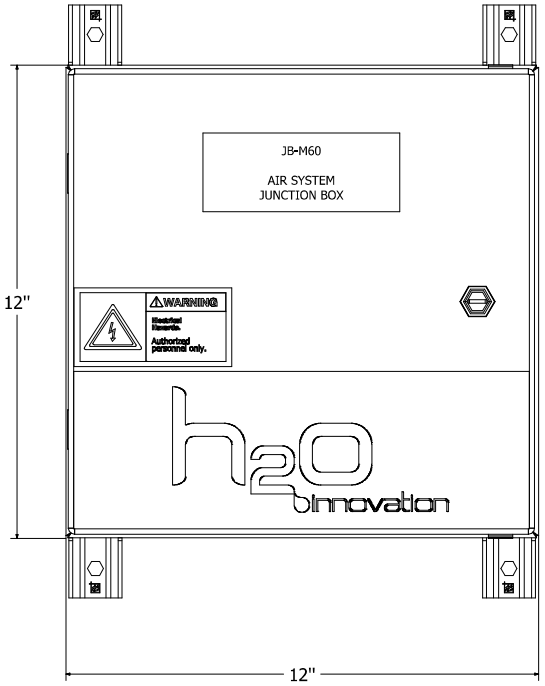


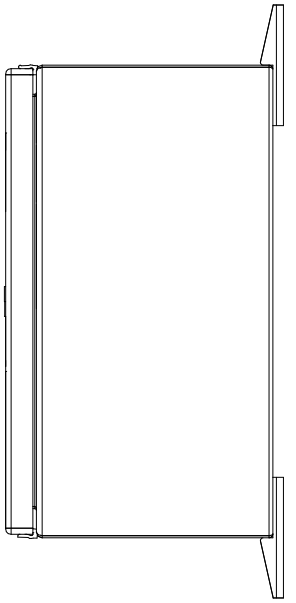

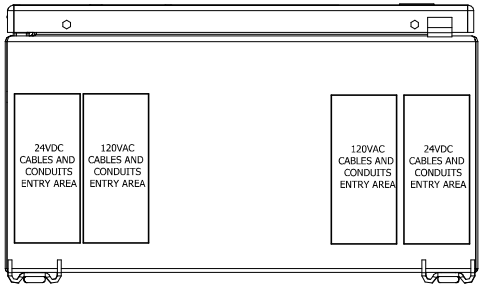


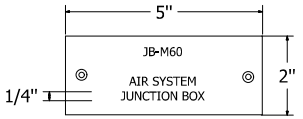


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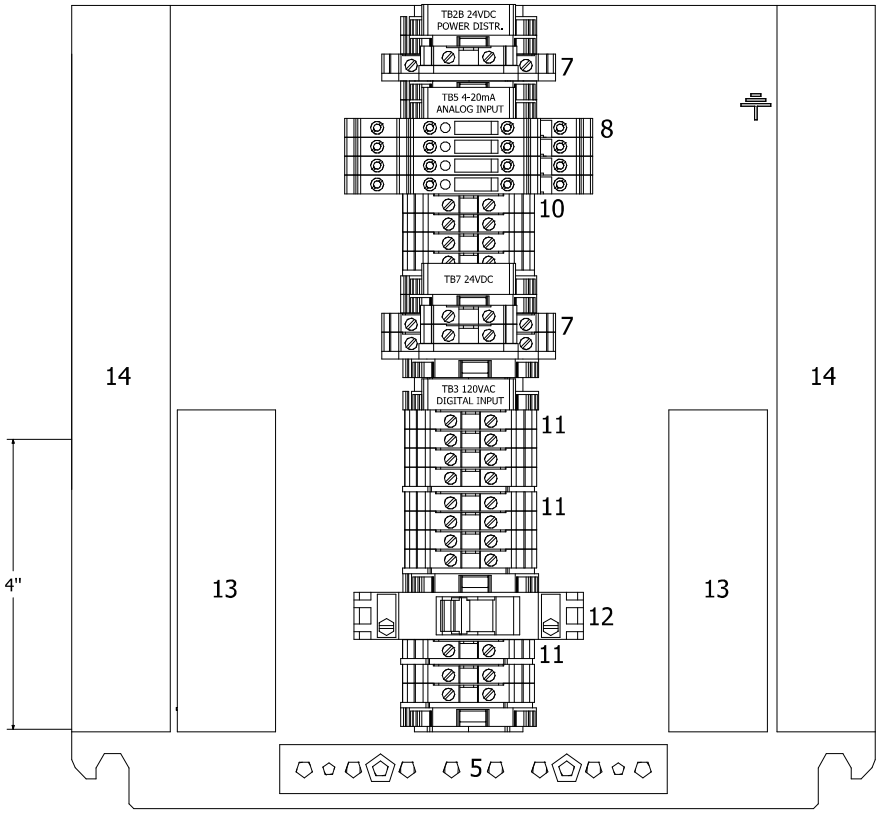


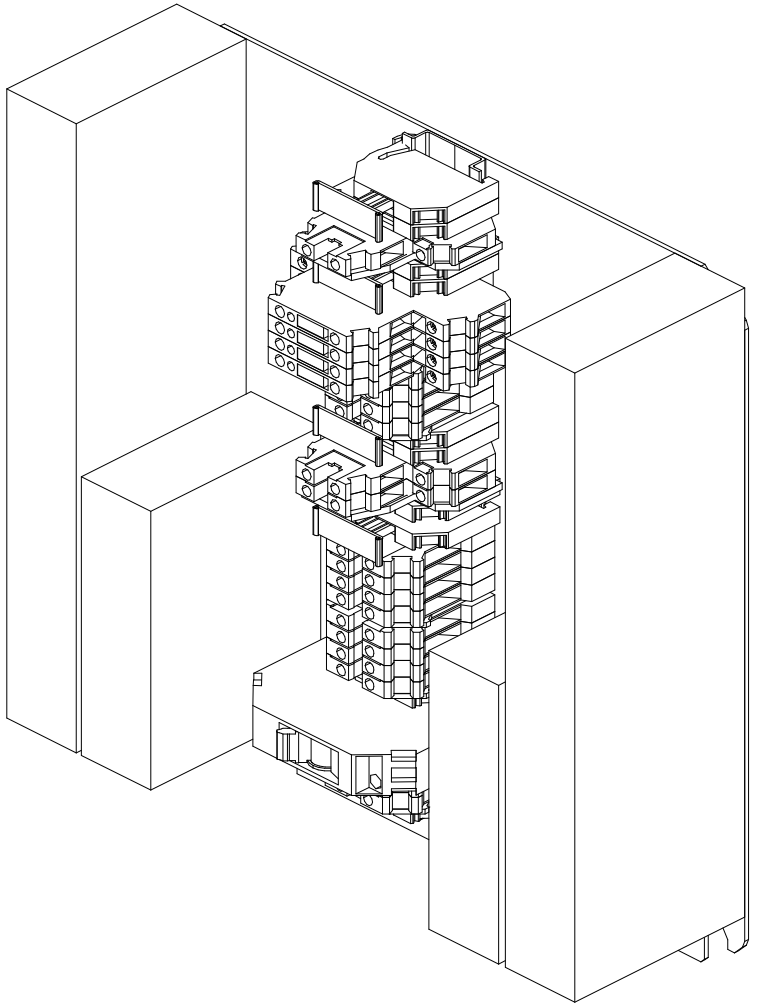

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|---|---|---|---|---|---|---|
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| 2 | 1 | N/A | CMFKSS | HOFFMAN | STAINLESS STEEL MOUNTING FOOT | DATASHEET |
| 3 | 1 | N/A | CP1212 | HOFFMAN | BACKPLATE PAINTED STEEL 12X12" | DATASHEET |
| 4 | 1 | N/A | CSD12126SS | HOFFMAN | WALL MOUNT ENCLOSURE, CONCEPT SERIES, QUARTER-TURN LATCH, NEMA4X, SS304, 12X12X6" | DATASHEET |
| 5 | 1 | N/A | UGB2/0-414-6 | PANDUIT | GROUNDING BAR, 6 WIRE PORT, #14-#4AWG | DATASHEET |
| 6 | 2 | N/A | 2770105 | PHOENIX CONTACT | TERMINAL STRIP END PLATE | DATASHEET |
| 7 | 3 | TB2B;TB7 | 2774091 | PHOENIX CONTACT | DOUBLE DECK TERMINAL BLOCK SCREW BLUE | DATASHEET |
| 8 | 4 | TB5 | 2800004 | PHOENIX CONTACT | DOUBLE DECK KNIFE DISCONNECT TERMINAL BLOCK | DATASHEET |
| 9 | 5 | N/A | 3003020 | PHOENIX CONTACT | TERMINAL STRIP END PLATE GRAY | DATASHEET |
| 10 | 4 | TB5 | 3003965 | PHOENIX CONTACT | SCREW TERMINAL BLOCK FOR SHIELD, GREEN | DATASHEET |
| 11 | 11 | N/A;TB3 | 3004362 | PHOENIX CONTACT | SINGLE-LEVEL TERMINAL BLOCK, SCREW, 32A, 24-10AWG, GRAY | DATASHEET |
| 12 | 1 | N/A | GB2CB08 | SCHNEIDER ELECTRIC | THERMAL MAGNETIC CIRCUIT BREAKER - TESYS GB2 SERIES -1P -3A | DATASHEET |
| 13 | 2 | N/A | TYD1X3NPG6 | THOMAS & BETTS | WIRING DUCT 1X3", GRAY | DATASHEET |
| 14 | 2 | N/A | TYD1X3NPW6 | THOMAS & BETTS | WIRING DUCT 1X3", WHITE | DATASHEET |
| 15 | 1 | N/A | DRS35X7.5S | TECHSPAN | DIN MOUNTING RAIL, ZINC | DATASHEET |
| 16 | 10 | N/A | 249-116 | WAGO | SCREWLESS END STOP | DATASHEET |
| 17 | 4 | N/A | 249-119 | WAGO | ADJUSTABLE GROUP MARKER CARRIER | DATASHEET |

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# APPENDIX P

# Resumes of Key Personnel

# (Envelope 1)

# MICHAEL HUMPHREYS

Senior Project Manager

## EDUCATION

- Edison Community College Water plant operations University of Florida
- Desalination technology Fairleigh Dickenson University
- Instrument maintenance training Leeds & Northrup Corporation
- Programmable control systems Texas Instruments
- Water Plant Operator License - Class A and B.

## YEARS OF EXPERIENCE

40

## CONTACT

mike.humphreys@h2oinnovation.com
Phone:(239) 283-8590
Mobile: (239)340-5637

## PROFESSIONAL SUMMARY

Boasting a 40-year tenure in reverse osmosis, desalination, nanofiltration, ultrafiltration, and membrane bioreactors, Mr. Michael Humphreys brings a vast expertise to his role as Senior Project Manager at $H_2O$ Innovation. He has been involved in the engineering, construction, and start-up activities of systems of various sizes. Leveraging his diverse training in water, wastewater, plant operations, and desalination technology, Mr. Humphreys provides engineering solutions and oversees start-up processes for numerous industrial clients.

## EXPERIENCE

**$H_2O$ Innovation USA, Inc. - Vista, CA, 2007 - present**
Senior Project Manager
Provides overall scheduling, budget management, supervision and management of project execution

**Membrane Systems Corporation - Poway, CA, 1994 -2007**
Field Service Manager/Project Engineer
Provided project engineering, project management, installation, start-up and commissioning of municipal and industrial projects

**Hydranautics - San Diego, CA, 1985 - 1994**
Director of Florida Field Operations/Site Engineering Supervised and provided field support in start-up of all major and minor plants in U.S.A.

Manager, Diablo Canyon Seawater Reverse Osmosis California Plant-PG&E (managed 4-member staff for operation and maintenance of the plant provided under BOOT.)

## MICHAEL HUMPHREYS

Senior Project Manager

# RELEVANT PROJECT EXPERIENCE (Partial List)

- Richard A. Reynolds Groundwater Desal Facility RO Expansion (Sweetwater Authority, Chula Vista, CA) - 5 MGD RO (2017)
- Hamby WWTP Improvements, Abilene, TX – 4.2 MGD RO Reclaim (2014)
- Hargesheimer WTP – Abilene, TX – 3rd Stage Concentrator – 0.460 MGD (2014)
- East Cherry Creek Valley Northern Water Project, CO- 7.6 MGD RO (2014)
- City of Sterling WTP, CO- 9.375 MGD RO (2013)
- Cape Coral, FL- 10 MGD RO (2009)
- Florida Keys Aqueduct Authority – 6 MGD RO (2009)
- City of Palm Coast, FL- 2.5 MGD RO (2008)
- City of Miramar, FL NF Plant 7.7 mgd
- U.S. Army Industrial Operations Command – High Purity VX Neutralization
- Boeing Helicopters – High Purity Gas Turbine NOX Mitigation
- Deerfield Beach, FL NF Plant 13.25 mgd
- Town of Highland Beach, FL RO Plant 3.0 mgd
- City of Ft. Myers, FL – NF 12.0 mgd
- Collier County, FL North Plant – NF 12.0 mgd
- Douglas Aircraft C17 Transport Startup Team
- Diablo Canyon Seawater RO Plant 0.58 mgd
- Chevron Seawater RO Plant – Gaviota, CA 0.40 mgd
- SEMADCO RO Plant - Egypt 1.32 mgd
- DOMEX RO Plant - Mexico 1.25-mgd
- Ft. Pierce Utilities RO Plant 7.25 mgd
- City of Boynton Beach NF Plant 4.0 mgd
- NAWA RO Plant - Tipp City, Ohio 5.0 mgd

# Aditya Kumar

Regional Area Manager

## PROFESSIONAL SUMMARY

Mr. Aditya Kumar has over a decade of experience in water and wastewater treatment, with a strong background in sales and technical expertise, as well as a proven track record in regional management roles. He currently holds the position of Regional Area Manager for the Western US at $H_2O$ Innovation, where he oversees market sales operations and manages a diverse customer portfolio.

## EXPERIENCE

**Regional Area Manager** • $H_2O$ Innovation
November 2019 – Present

**Lead Field Engineer** • Nanostone Water
July 2014 – November 2019

**Regional Sales Manager** • Aquatech International
April 2014 – July 2014

**Field Service Engineer** • Aquatech International
August 2011 – April 2014

**Laboratory Analyst** • Microbac Laboratories Inc.
October 2008 – May 2010

## RELEVANT PROJECT EXPERIENCE (PARTIAL LIST)

For the projects listed below, Mr. Aditya acts as the key liaison for the end user upon project commissioning. He facilitates seamless communication and ensures that project requirements are met. He is namely responsible for supplying quotes for automation support, spare parts, and chemicals while offering comprehensive service support.

**Morro Bay (2022)**

## EDUCATION

BS, Chemistry and Biology,
Gannon University, 2009

## PROFESSIONAL AFFILIATIONS

- American Water Works Association (AWWA)
- American Membrane Technology Association (AMTA)
- Northwestern Membrane Operator Association (NWMOA)
- Southwestern Membrane Operator Association (SWMOA)

## YEARS OF EXPERIENCE

15

## CONTACT

aditya.kumar@h2oinnovation.com
760-985-0246

Mr. Aditya serves as the primary point of contact for the Morro Bay project end user. In this capacity, he namely oversees the supply of chemicals such as antiscalant and cleaners, along with spare parts, for the 1 MGD water reuse facility that incorporates MBR, RO, and UV technologies.

**Santa Monica (2022)**

Mr. Aditya's responsibilities encompass the continued supply of specialty chemicals, including antiscalant and cleaners, and providing on-site support for the 2 MGD indirect potable reuse project with MBR, UF, RO, and AOP.

**Escondido (2023)**

Mr. Aditya oversees the on-site service and ensures the ongoing supply of specialty chemicals, such as antiscalant and cleaners, as well as commodity chemicals for the 2 MGD UF/RO water reuse facility in Escondido.

**City of Beaumont, CA (2019)**

Mr. Aditya manages service contracts and supplies specialty chemicals, namely cleaners, and spare parts for the 2.2 MGD RO facility in the City of Beaumont.

**Fort Irwin (2016)**

Mr. Aditya manages the project's lab services and oversees the supply of essential spare parts and specialty chemicals such as antiscalant and cleaners for the UF/RO Fort Irwin's drinking water system. As part of his role, he collaborates with Jacobs, who are the operation & maintenance provider for this project.

**San Diego Pure Water (2024)**

Mr. Aditya was involved in the factory acceptance test and will be the account manager for this 40 MGD UF water reuse project in California, which is set to be commissioned in 2024.

**Valencia (2020)**

Mr. Aditya collaborates with the Los Angeles County Sanitation District (LACSD) regarding the Valencia Water Reclamation Plant project and will act as the account manager for this 10.3 MGD UF and RO facility.

# BILL LEGGE

Manager, Process & Application Engineering

## EDUCATION

- B.Sc., Civil Engineering - Technical University of Nova Scotia

## MEMBERSHIPS

- Registered professional engineer – Ontario, Nova Scotia, Prince Edward Island
- American water works association (AWWA)
- American Membrane Technology Association (AMTA)

## YEARS OF EXPERIENCE

30+

## CONTACT

Bill.Legge@h2oinnovation.com
289-813-5533, ext 107

## PROFESSIONAL SUMMARY

With over 30 years of water treatment and engineering experience, Mr. Bill Legge possesses expertise in project management, detailed engineering design, environmental assessment, project permitting and approvals, contract administration, construction engineering, and facility commissioning. As a member of the $H_2O$ Innovation team, Mr. Legge is in charge of developing technical and commercial strategies for offerings related to capital treatment equipment systems. He is actively involved in the design, project execution, plant startup, service support, and optimization of mechanical treatment plant facilities, with a primary focus on conventional and low-pressure membrane technologies.

## EXPERIENCE

**Manager – Process & Application Engineering ▪ $H_2O$ Innovation**
2013 – Present

**Senior Drinking Water Process Engineer ▪ GE Water & Process Technologies**
2006 – 2013

**Principal, Process Engineer ▪ CBCL Consulting Engineers**
1998 – 2006

**Project Manager ▪ Vaughan Engineering Associates**
1993 – 1998

## PROJECTS

Mr. Legge's responsibilities for the projects listed below encompass the implementation of drinking water, industrial, and tertiary wastewater plants from diverse sources, defining process and overall design requirements for new project opportunities, and providing technical guidance throughout project execution. Additionally, Mr. Legge ensures regulatory compliance and permitting for drinking water facilities, assessing treatment process hydraulics, and managing the company's competitive analysis framework.

**BILL LEGGE**
Manager, Process & Application Engineering

- **North City Pure Water**, San Diego, CA. 40 MG. Pressurized, tertiary UF
- **Sherman WTP**, Sherman, TX. 11.3 MGD. Pressurized UF membrane system followed by RO.
- **Englishman River WTP**, Parksville, BC. 4.2 MGD. Pressurized, two-stage, UF membrane system.
- **Carlsbad Water Recycling Facility**, Carlsbad, CA. 3.4 MGD. Pressurized, tertiary UF.
- **Innisfil WTP**, Innisfil ON. 10 MGD. Pressurized, two-stage, UF membrane system retrofit.
- **Northern Bundle WTP projects**, AB. Pressurized UF membrane systems followed by NF.
- **Montevina WTP**, San Jose, CA. 30 MGD. Pressurized PES UF membrane system.
- **Clifton WTP**, Clifton CO. 12 MGD. Pressurized UF membrane system retrofit.
- **Lorne Park WTP**, Mississauga, ON. 100 MGD. Large immersed membrane retrofit.
- **Delaware WTP**, Delaware OH. 6.75 MGD. Pressurized UF membrane system followed by NF.
- **Lakeview Phase II**, Mississauga, ON. 105 MGD. Phase II project expanded the plant capacity to 210 MGD.
- **Nanaimo WTP**, Nanaimo, BC. 30 MGD. Two-stage, siphon immersed UF WTP.
- **Abbotsford WTP**, Abbotsford BC. 14 MGD. ZeeWeed 500 plant expansion and retrofit.
- **Fargo WTP**, Fargo, ND. 18 MGD. Low pressure immersed UF pretreatment to RO system.

# SÉBASTIEN BARBEAU

Senior Process & Applications Engineer

## EDUCATION

Bachelor's Degree in Mechanical Engineering, Québec Université Laval (2001 - 2005)

Partial Training in Physical Engineering, Québec Université Laval (1999 - 2000)

D.E.C. in Natural Sciences, Québec Cégep François-Xavier-Garneau (1996 - 1998)

## YEARS OF EXPERIENCE

17+

## CONTACT

sebastien.barbeau@h2oinnovation.com

## PROFESSIONAL SUMMARY

Sébastien Barbeau holds a bachelor's degree in mechanical engineering and has over 17 years of experience as an engineer, during which he has acquired in-depth knowledge of process mechanics, water treatment, energy recovery, and technical training. In his current role as Senior Process & Applications Engineer at $H_2O$ Innovation, he analyzes plans and specifications, designs equipment, evaluates costs, analyzes risks, supports projects, and manages pilot tests, thereby showcasing his comprehensive knowledge of the industry and his commitment to delivering successful projects.

## EXPERIENCE

**Senior Process & Applications Engineer ▪ $H_2O$ Innovation**
2023 — Present

**Project Manager, Senior Eng. ▪ TETRA TECH**
2017 — 2023

**Process Engineer ▪ $H_2O$ Innovation**
2007 — 2017

**Estimator, Junior Eng. ▪ GROUPE GLOBAL TARDIF**
2007

## RELEVANT PROJET EXPERIENCE (PARTIAL LIST)

**Project Management – Ville de Lévis (Tetra Tech, 2021 – 2023**

- Project Manager - Usine de traitement d'eau de Saint-Romuald Filter refurbishment and ozonation system upgrade. In charge of process mechanics, coordination, building mechanics, automation, electricity, architecture & structure.

**Project Management – Ville de Québec ($75 M, Tetra Tech, 2018 – 2022)**

- Building Mechanics & Process Manager for the Centre de récupération de matières organiques (CRMO) project (treatment, fire protection, ventilation/heating, dust control, storm drainage, sanitary drainage, utility water system), coordination with vario departments.

**SÉBASTIEN BARBEAU**
Senior Process & Applications Engineer

- Specific emergency plan (SEP) for the risk of sewer back[illegible] various parts of the city.
- Replacement and upgrade of rainwater pipes at the Limoilou station (±$1.5 million).
- Project management support for the water treatment plant in Sainte-Foy (± $25 M).

**North Shore Wastewater Treatment Plant, Vancouver (+700 M$, Tetra Tech, 2017 – 2018)**

- Process mechanics manager
- Coordinator of the various disciplines involved (architecture, structure, building mechanics, mechanical drawings, instrumentation, and control)

**Execution of a variety of projects (H2O Innovation, 2007 – 2017)**

- Sousse Power Plant, Tunisia (2010 – 2012, ± $1.5 M)
- Consumer Energy, West Olive Plant, MI (2012, ± $700 K)
- Xcel Energy, Sherco Plant, MN (± $500 K)
- Monterey Peninsula Water Supply, California (± $10 M, 2014 - 2016)
- Hydro-Québec, La Romaine (± $70 K, 2016)
- Several other projects (ranging from $15 K to $750 K)

# CHRIS WHITING

Senior Director of Projects, North America

## EDUCATION

- Water Quality Technology Diploma, Okanagan University
- Associate Degree in Science, Okanagan University

## YEARS OF EXPERIENCE

20+

## CONTACT

chris.whiting@h2oinnovation.com
403-269-7479 ext. 401

## PROFESSIONAL SUMMARY

Mr. Chris Whiting has over 20 years of project management experience in the water and wastewater industry, namely with client liaison, managing and directing site construction activities including subcontractors, coordinating, and directing multidisciplinary design teams, schedule, and budget management, as well as providing control and oversight on project deliverables. Mr. Whiting has been responsible for numerous water and wastewater treatment plant projects across Canada and the US, including full-scope turn-key projects. As a member of $H_2O$ Innovation's team, Mr. Whiting is responsible for the project management team.

## EXPERIENCE

**Senior Director of Projects ▪ $H_2O$ Innovation**
2008 – Present

**Project Manager ▪ Sigma Environnemental Solutions**
2004–2008

**Project Manager/Site Foreman ▪ Waterworks technologies**
1999–2004

## RELEVANT EXPERIENCE

For the projects listed below, Mr. Whiting has provided comprehensive onsite technical support, management, and leadership for $H_2O$ Innovation projects worldwide, namely overseeing project installation, commissioning, operator training, cost management, customer communication, and schedule direction.

**5000-Person Camp Potable Package ($8M)**

Mr. Whiting acts as the project manager for this new water treatment facility designed to treat surface water from the Athabasca River. The project has a capacity of 3000 m3/day and integrates multimedia filtration, ultrafiltration, nanofiltration, ultraviolet disinfection, and chemical feed systems. Additionally, the scope includes a 1500 m3 water storage tank and distribution pumps.

**CHRIS WHITING**
Senior Director of Projects, North America

The system was delivered as a turn-key solution, constructed within a skid-mounted oil field building in Calgary. Transported to the site in four sections, it was then installed on screw piles in Fort McMurray.

### 1000 Person Camp Potable Package ($2.5M)

Mr. Whiting acts as the project manager for a new water treatment facility used to treat groundwater. The facility comprises an installed capacity of 300 m3/day and incorporates greensand filtration, ultrafiltration, nanofiltration, and chemical feed systems. Additionally, the project includes distribution pumping systems. The system is delivered as a turn-key solution, constructed in a skid-mounted oil field building in Calgary, and then transported to the site for installation on screw piles.

### 1000 Person Camp Sewage Package ($3.7M)

Mr. Whiting oversees the project management of a new packaged sewage treatment package designed for a camp. The system incorporates flow equalization, Bio-WheelTM, Toray flat sheet membrane bioreactors, and ultraviolet disinfection. This turn-key solution was constructed in a skid-mounted oil field building in Calgary and then transported to the site for installation on screw piles.

# DENIS GUIBERT, Ph. D, P. Eng

Vice-President & Managing Director

## EDUCATION

- Ph.D. Chemical Engineering
- M.Sc. Chemical Engineering
- National Institute of Applied Sciences, Toulouse, France

## MEMBERSHIPS

- Registered professional engineer – Ontario
- American water works association (AWWA)
- American Membrane Technology Association (AMTA)

## YEARS OF EXPERIENCE

25

## CONTACT

denis.guibert@h2oinnovation.com
289-813 5533, ext 105

## PROFESSIONAL SUMMARY

With 25 years of experience in the membrane industry, Mr. Denis Guibert possesses comprehensive knowledge of the membrane cycle, spanning from product development to sales, and full-scale design and operation. Within the $H_2O$ Innovation team, he is in charge of the Water Technologies & Services division and is responsible for the design, project execution, plant startup, service support, and optimization of the several hundred MGD of plant capacity installed by $H_2O$ Innovation.

## EXPERIENCE

**Vice-President & Managing Director – WTS Division**
$H_2O$ Innovation / 2018 - Present

**Process and Engineering Leader**
$H_2O$ Innovation / 2012 - 2018

**North America Process Leader – UF/RO/E-Separation**
GE Water / 2008 - 2012

**Process Engineer - UF**
GE Water / 2003 - 2008

**R&D Engineer**
Zenon Environmental / 1998 - 2003

## PROJECTS

Mr. Guibert's spent his early career developing new design for Ultrafiltration membranes, validating new module design, fiber chemistries, and operating strategies to optimize the technology as it was taking off in the early 2000's against conventional technologies.

As a process engineer, Mr. Guibert applied engineering principles to the process design of large low pressure membrane facilities and was involved in their optimization and troubleshooting once facilities were put online. As the North American leader for Ultrafiltration, Reverse Osmosis and Electro-Separation, Mr. Guibert led a team of engineers to design, deploy and support all these technologies. Mr Guibert had the

**DENIS GUIBERT, Ph. D, P. Eng**
Vice-President & Managing Director

opportunity to work on some key projects, like the 105 MGD La ON drinking water facility which was the largest ultrafiltration plant in the world at the time. Another milestone project was the Twin Oaks, CA project, a Zero Liquid Discharge facility with its specific challenges.

In his most recent role, Mr. Guibert has been responsible for the sales, design, fabrication, commissioning, project management and servicing for facilities using conventional filtration, greensand filters, ultrafiltration, reverse osmosis, bioreactors and UV technologies.

# NICOLAS CORMIER, P.Eng.

Director, Project Engineering

## EDUCATION

- B.Sc. Chemical Engineering, Université Laval
- B.Sc. Chemistry, Université de Moncton

## PROFESSIONAL AFFILIATIONS

- Ordre des Ingénieurs du Québec (OIQ)
- Association of Professional Engineers and Geoscientists of Alberta (APEGA)
- Engineers and Geoscientists BC (pending)

## YEARS OF EXPERIENCE

5

## CONTACT

nicolas.cormier@h2oinnovation.com
506-269-3977

## PROFESSIONAL SUMMARY

Mr. Nicolas Cormier brings 5 years of experience in Project and Process Engineering within the water and wastewater treatment sector. Specializing in membrane-based systems, including MBR, UF, and RO systems, he has successfully managed projects ranging from pilot scale to multi-million-dollar ventures for both municipal and industrial applications. He currently holds the position of Director, Project Engineering at H2O Innovation.

## EXPERIENCE

**Director, Project Engineering ▪ H2O Innovation**
March 2022 – Present

**Process & Application Engineer ▪ H2O Innovation**
June 2021 – March 2022

**Project Engineer ▪ H2O Innovation**
January 2018 – June 2021

## PROJECTS

For the projects listed below, Mr. Cormier, in his capacity as Director of Project Engineering, manages a team of 8 engineers, driving internal continuous improvement initiatives and ensuring compliance with regulations and standards. He actively participates in cross-department initiatives, provides mentoring to new staff, and coordinates problem-solving efforts with other departments.

- Lakeshore – Innisfil, ON, 6.6 MGD, Pressurized UF (wastewater)
- Campbell Soup – Napoleon, OH, 1.0 MGD, RO (Food & Beverage)
- Moosehead Brewing – St-John, NB, 0.5 MGD, RO (food & beverage)

**NICOLAS CORMIER, P.Eng.**
Director, Project Engineering

- Holland America – Denali, AK, 0.4 MGD, RO (drinking
- Texas Capstone – Austin, TX, 0.3 MGD, MBR-RO-UV (wastewater reuse)
- Elevate Textiles – Mexico, 0.2 MGD, RO (wastewater reuse)
- Petit-Rocher – P-R, NB, 2700 m3/day, MMF-RO (drinking water)
- Fermont – Fermont, QC, 100 m3/day, MMF-RO-UV (drinking water)
- Elkwood – Elkwood, AB, 50 m3/day, MBR (wastewater)
- Camp Love – Fermont, QC, 40 m3/day, GSF-RO-UV (drinking water)

**Blair Kariniemi**
Project Engineer

Office: (289) 813 5533, ext 110
Blair.Kariniemi@h2oinnovation.com

Over 5 years of experience in industrial and municipal water treatment engineering.

As a member of the $H_2O$ Innovation team, Mr. Kariniemi is responsible for the mechanical design of water treatment systems. This includes equipment selection, drawing submittals, hydraulic design, and process design.

## Education

Bachelors of Mechanical Engineering
*University of Minnesota – Twin Cities, 2011*

## Professional Experience

**$H_2O$ Innovation, 2013-2019**
Mechanical & Systems Engineer

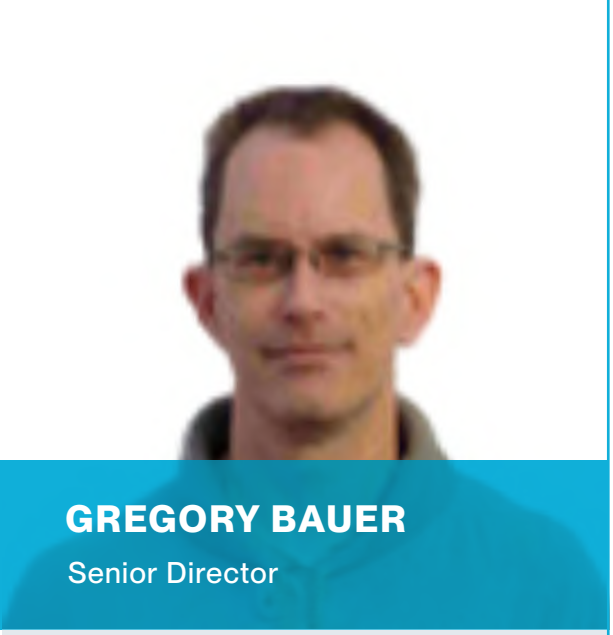
**Electric Machinery/WEG, 2012 - 2013**
Applications Engineer

## Keys areas of expertise and responsibilities include

- Selection of equipment, instruments, and valves for water and wastewater plants.
- Develop detailed engineering designs of drinking water, industrial, tertiary, and wastewater plants with a focus on ultra-filtration, reverse osmosis, and nanofiltration membranes.
- Support customers and suppliers on the design of various mechanical systems in a treatment plant.
- Review and provide guidance on the hydraulic design of water treatment plants.
- Coordination of projects across multiple disciplines.

## Select Projects

- **Carlsbad WRF,** Carlsbad, CA, UF, pressure skids, 3.4 mgd.
- **Sherman WTP,** Sherman, TX, RO,2.0 mgd.
- **Cinco MUD1**, Cinco, TX, RO, 2.0 mgd.
- **University of Iowa**, Iowa City, IA, RO, 2.5 mgd.
- **Loudon Water,** Leesburg, VA, UF, pressure skids, 0.45 mgd.
- **Tate Monroe,** Moscow, OH, RO, 0.6 mgd, retrofit.
- **City of Quincy IRWTP**, Quincy, WA, RO, adjustable number of stages, 1.44 mgd.
- **Craven County Treatment Facility,** New Bern, NC, RO, 2.0 mgd.
- **Stornoway Mine,** Northern QC, MMF/RO, containerized, 0.25 mgd.
- **West Basin Municipal District,** California, UF, portable/containerized system, 1.0 mgd.



# GREGORY BAUER

Senior Director

## EDUCATION

- Cartographic Technology Diploma, Sir Sandford Fleming College
- Architectural Technology Diploma, Centennial College

## YEARS OF EXPERIENCE

25

## CONTACT

gregory.bauer@h2oinnovation.com
289-813-5533 ext 102

## PROFESSIONAL SUMMARY

With over 18 years of experience in drafting and design for water treatment equipment and plants, Mr. Gregory Bauer is responsible for the design and drafting of various equipment, such as membranes, clarifiers, screens, air-processing systems, and more. Mr. Bauer has actively contributed to the drafting of Process Flow Diagrams (PFDs) and Piping and Instrumentation Diagrams (P&IDs), as well as the creation of plant layouts and fabrication details for over 50 water treatment plants and portable systems. His expertise extends to optimizing drafting processes through the establishment of company standards and tools for MicroStation and AutoCAD drafting software.

## EXPERIENCE

**Senior Designer ▪ $H_2O$ Innovation**
2012 – Present

**Drafter/designer ▪ Ovivo/Eimco Water Technologies**
2008 – 2012

**Drafter/designer ▪ GE Water**
2003 – 2007

**Drafter/designer ▪ Zenon Environmental**
1998 – 2003

## PROJECTS

For the projects listed below, Mr. Bauer handled the drafting and design of water treatment equipment and plants. He contributed significantly to the creation of PFDs and P&IDs, along with plant layouts and fabrication details for over 50 water treatment plants and portable systems that incorporated various technologies, such as membranes, clarifiers, screens, and air-processing systems. Additionally, Mr. Bauer played a pivotal role in setting drafting standards and optimization tools for MicroStation and AutoCAD software within the company.

- Lakeview, ON – 105 MGD ultrafiltration plant in 2006. Largest in the world at the time

**GREGORY BAUER**

Senior Director

- Waikato, New Zealand – 39 MGD
- Implementation of 3D MicroStation PlantSpace drafting software at Zenon Environmental SROD shipboard desalination system for the Canadian navy
- ROWPU portable drinking water system for the Canadian army
- Shipboard grey water treatment systems for Holland America Line cruise ships
- Several ZeeWeed-1000 and ZeeWeed-500 plants in North America

# DUSTIN ZACHMAN

Automation & Controls Engineer

## EDUCATION

- B.S. Industrial Engineerin, Dunwoody College of Technology

## YEARS OF EXPERIENCE

25

## CONTACT

denis.guibert@h2oinnovation.com
289-813 5533, ext 105

## PROFESSIONAL SUMMARY

With over 10 years of experience in the water treatment industry, Mr. Dustin Zachman possesses comprehensive knowledge of developing automation and controls for membrane water treatment systems. He currently holds the position of Automation & Controls Engineer at $H_2O$ Innovation.

## EXPERIENCE

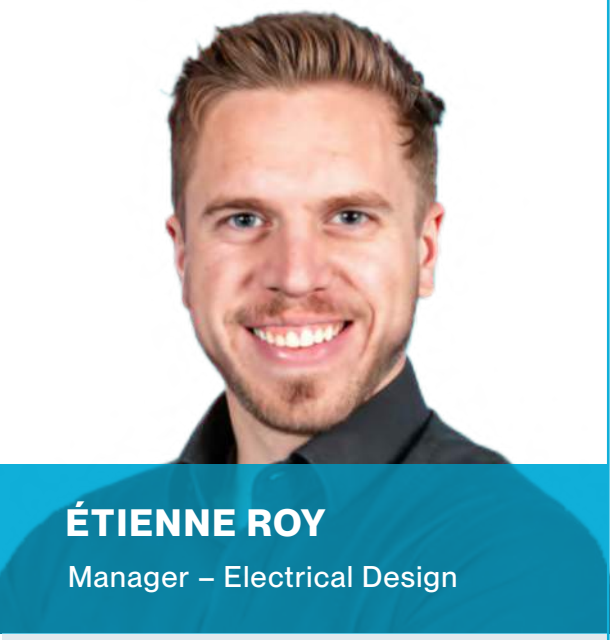
**Automation & Controls Engineer - $H_2O$ Innovation**
2013 – Present

**Electronics Technician - Black Box Resale Services**
2006 – 2013

## RELEVANT EXPERIENCE

For the projects listed below, Mr. Zachman has played a pivotal role in developing automation and controls for membrane water treatment systems. Additionally, he has provided support for the integration of these systems with plant-wide automation and control systems.

- **Innisfil, Ontario, Canada** – 10 MGD, UF, Programmer (under contract)
- **Montevina, San Jose, CA** – 30 MGD, Programmer (under contract)
- **Clifton Water District** – 12 MGD, UF, Programmer
- **City of Delaware, OH** – 6.75 MGD, UF/3.33 NF, Programmer
- **West Basin Portable UF, CA** – 1 MGD UF, Programmer



# ÉTIENNE ROY

Manager – Electrical Design

## EDUCATION

- Diploma of College Studies in Electrical Engineering, Centre intégré de formation et d'innovation technologique (CIFIT)

## YEARS OF EXPERIENCE

25

## CONTACT

denis.guibert@h2oinnovation.com
289-813 5533, ext 105

## PROFESSIONAL SUMMARY

Mr. Étienne Roy joined $H_2O$ Innovation at one of the manufacturing plants in Ham-Nord in 2014 as an Electrical Designer. Currently based at the headquarters in Quebec City, Mr. Roy oversees and manages various electrical, instrumentation, and control works associated with water treatment systems. With almost 10 years of hands-on experience in electrical engineering, his responsibilities span across the diverse engineering design stages to the fabrication of power and control panels.

## EXPERIENCE

**Manager – Electrical Design ▪ $H_2O$ Innovation**
2019 – Present

**Electrical Designer ▪ $H_2O$ Innovation**
2014 – 2019

## PROJECTS

For the listed projects, Mr. Étienne Roy manages project schedules, implements cost-effective strategies, upholds a robust quality control system, reviews electrical power and control diagrams, and spearheads corporate risk management initiatives. His involvement extends to engaging in commercial negotiations with vendors, providing valuable technical guidance throughout various project phases, and establishing/enforcing corporate drawing standards for consistency and compliance.

- **Lakeshore** – Innisfil, ON, 6.6 MGD, Pressurized UF (wastewater)
- **Sherman WTP** – Sherman, TX, 11.3 MGD, Pressurized (drinking water)
- **North City Pure Water** – San Diego, TX, 40 MGD, Pressurized UF (drinking water)
- **Montevina WTP** – San Jose, CA, 30 MGD, Pressurized PES UF
- **Pearland** – Pearland, TX, 10 MGD, Pressurized UF (drinking water)
- **Brandon** – Brandon, MB, 8/6 MGD, UF/RO (drinking water)
- **Englishman River** – Parksville, BC, 4.2 MGD, Pressurized, two-stage, UF
- **Campbell Soup** – Napoleon, OH, 1.0 MGD, RO (Food & Beverage)
- **Moosehead Brewing** – St-John, NB, 0.5 MGD, RO (food & beverage)
- **Holland America** – Denali, AK, 0.4 MGD, RO (drinking water)

8900, 109th Ave N, #1000
Champlin, MN 55316
Phone: (763) 566-8961

Bill.Youels@h2oinnovation.com

## William E. Youels
Commissioning Specialist

Strong knowledge of water treatment systems and membrane filtration

- Experienced in general assembly, field installation and service
- Experienced in maintenance and operation of desalination systems, RO systems, UF systems
- Extensive experience in training, and electrical controls including flow, pressure, level, variable frequency drives, control and high voltage panels.

## Education & Training

Automotive Technology
*Stark Technical College*

## Professional Experience

**$H_2O$ Innovation USA, Inc. – Champlin, MN, 2014 – present**
Commissioning Specialist
Supervise the installation, start up testing, membrane loading, diagnostics and commissioning of water purification equipment. Provide onsite technical direction and phone troubleshooting. Repair or replace electrical and mechanical components as deemed necessary.

**Harn RO Systems ---Venice, FL 2004 to 2014**
Senior Field Service Representative
Supervise the installation, start up testing, membrane loading, diagnostics and commissioning of water purification equipment. Provide onsite technical direction and phone troubleshooting. Repair or replace electrical and mechanical components as deemed necessary.

**Ultrapure Group – North Port, FL 2003 to 2004**
Technical Service Representative
Train new employees to read and understand AutoCAD and P & I D drawings for construction, operation and maintenance of R/O systems and EDI systems. Install components, piping, pumps and other mechanical assemblies for operation. Perform field service for the installation, repair or maintenance of water purification equipment.

**Haliant Technologies – Venice, FL 2002 to 2003**
Project Manager
AutoCAD design to customer requirements. Review of equipment design for customers. Process and Instrumentation Diagrams for fluid flow. Hands on in manufacturing department to get equipment built, tested and shipped. Performing field service for installation and start up.

**Trionetics Incorporated– Twinsburg, OH 1995-2002**
Production Manager
Supervised the assembly, testing and delivery of many types of water purification equipment for industrial and municipal use. Also involved in the installation and commissioning.

# SÉBASTIEN TREMBLAY

Commissioning Representative

## TRAINING

- **2017** Certificat en traitement complet d'eau de surface (*Certificate in comprehensive surface water treatment*) (OST)
- **2015** WHMIS 2015
- 2015 Construction Site Health and Safety (ASP)
- **2013** First Aid
- 2012 Health and Safety — Trenches and Excavations Without Shoring
- 2011 Signalisation des travaux routiers (*Road Work Signage*) (APSAM)
- 2009 Espaces clos (*Confined Spaces*) (APSAM)
- 2005 Attestation d'expérience en traitement d'eau potable (*Attestation of Experience in Drinking Water Treatment*) (Px)
- 2005 Certificat en réseau de distribution d'eau potable (*Certificate in Drinking Water Distribution Nnetwork*) (ORD)

## YEARS OF EXPERIENCES

14

## CONTACT

Sebastien.tremblay@h2oinnovation.com

## PROFESSIONAL SUMMARY

With over 14 years of experience in the water treatment industry, Mr. Sébastien Tremblay has acquired a vast expertise in membrane treatment, including the installation, commissioning, operation, and maintenance of a variety of equipment such as nanofiltration, reverse osmosis, ultrafiltration, and bioreactor systems. In his role as commissioning representative at $H_2O$ Innovation, he supervises on-site system installations and manages equipment commissioning, testing, diagnostics, and operator training. Having developed a solid understanding of electrical controls, programming, and industrial operations, Mr. Tremblay contributes significantly to the implementation and maintenance of advanced water treatment systems.

## EXPERIENCE

Commissioning Representative ▪ **$H_2O$ Innovation**
2017 — Present

Water Treatment Plant Operator ▪ **Eskera, Quebec**
2017 — 2017

Drinking Water & Public Works Operator ▪ **Municipality of Saint-Irénée**
2000 — 2017

## RELEVANT PROJECT EXPERIENCE (PARTIAL LIST)

- Ultrafiltration and Reverse Osmosis Plant – Morro Bay, CA
- Ultrafiltration and Reverse Osmosis Plant – Escondido, CA
- UF Drinking Water Plant – Innisfil, ON
- MBR Wastewater Treatment Plant (BME) – Fort McMurray, Alberta
- Nanofiltration Drinking Water Production Plant – Kuujjuaq, Quebec

# PAUL BARTLETT

Director of Automation and Service

## EDUCATION

- Bachelor of Science in Applied Physics and Mathematics, University of Wisconsin

## YEARS OF EXPERIENCE

15

## CONTACT

Paul.bartlett@h2oinnovation.com
763-566-8961, ext. 314

## PROFESSIONAL SUMMARY

With 15 years of experience in engineering, Mr. Paul Bartlett is responsible for the development of technical and commercial strategies for offerings related to capital treatment equipment systems at $H_2O$ Innovation. He is actively involved in the design, project execution, plant startup, service support, and optimization of mechanical treatment plant facilities, with a primary focus on conventional and low-pressure membrane technologies.

## EXPERIENCE

**Electrical and Controls Engineer ▪ H2O Innovation**
2011 – Present

**Design Engineer Intern ▪ Royal Enterprises**
2009 – 2011

## PROJECTS

For the projects listed below, Mr. Bartlett's responsibilities include the development of conceptual, preliminary, and detailed electrical engineering designs for water treatment plants. He is involved in the implementation of drinking water, industrial, and tertiary wastewater plants from a wide range of sources, defining electrical requirements for new project opportunities, providing technical guidance associated with performance guarantees and risk assessment, as well as offering support during project execution, including onsite assistance and commissioning of plants.

Mr. Bartlett as served as lead Electrical and Controls engineer on over 30 immersed and pressurized membrane plants:

- Innisfil WTP, Innisfil ON. 10 MGD. Pressurized, two-stage, UF membrane system retrofit.
- Sherman WTP, Sherman, TX. 11.3 MGD. Pressurized UF membrane system followed by RO.

## PAUL BARTLETT

Director of Automation and Service

- Sherman WTP, Sherman, TX. 11.3 MGD. Pressurized UF me system followed by RO.
- Montevina WTP, San Jose, CA. 30 MGD. Pressurized PES UF membrane system.
- Clifton WTP, Clifton CO. 12 MGD. Pressurized UF membrane system retrofit.
- Delaware WTP, Delaware OH. 6.75 MGD. Pressurized UF membrane system followed by NF.
- Cambria WTP, Cambira CA. Pressurized UF membrane system followed by NF. (Winner of 2015 Desalination Plant of the Year – Distinction Award)
- East Cherry Creek Brine Minimization Project, Electrical Design, 2011
- Suncor Energy - Fort Hills Project, Electrical and Controls Design, 2011
- Arroyo Grande Wastewater Treatment, Electrical Design, 2011
- Emmons County Water Treatment Facility, Controls Design, 2011
- Enmax Shepard Energy RO Plant, Electrical and Controls Design, 2012
- Renfro Corporation Water Treatment System, Electrical and Controls Design, 2012
- Conoco Philips Canada Demineralization Water Treatment System, RO Electrical Design, 2012
- Cal Poly Pomona Water Treatment Facility, Electrical and Controls Design, 2012
- City of Hillsboro Water Treatment Facility, Electrical and Controls Design, 2012
- Xcel Energy King Plant Water Treatment, Electrical Design, 2012
- Devon Jackfish Wastewater Treatment Facility, Electrical and Controls Design, 2012

**Shayan Yaghoubi, M.Eng., P. Eng.**
Regional Technical Sales Manager

## EDUCATION

- B.Sc. in Chemical Engineering, Azad University
- M.Eng. in Chemical Engineering, University of Toronto
- Advanced Water Technologies and Process Design Certificate, University of Toronto
- Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE) Certificate, University of Toronto

## MEMBERSHIPS

- Professional Engineers of Ontario (PEO)
- American Membrane
- Technology Association (AMTA)
- American Water Works
- Association (AWWA)
- Water Environment
- Federation (WEF)

## YEARS OF EXPERIENCE

7

## PROFESSIONAL SUMMARY

Mr. Shayan Yaghoubi has over 7 years of experience in application and process engineering, sales management, and business development within the water and wastewater treatment industry. His specialization revolves around advanced water treatment technologies, with a particular emphasis on membrane-based systems such as MBR, UF, and RO. Mr. Yaghoubi has successfully undertaken multimillion-dollar projects, catering to both municipal and industrial applications. His expertise spans from the development of conceptual, preliminary, and detailed engineering process designs to the effective implementation and sales management that drive successful outcomes in the field of water treatment.

## EXPERIENCE

**Regional Sales Manager for Capital Equipment** ▪ H2O Innovation
2019 – Present

**Lead Application Engineer** ▪ Pure Aqua Inc.
2018 – 2019

**Process Engineer** ▪ Hatch
2017 – 2018

## RELEVANT EXPERIENCE

For the projects listed below, Mr. Shayan Yaghoubi has planned municipal and industrial bids, developed comprehensive technical and commercial proposals, and expanded the existing client base through conferences, strategic partnerships, and technical presentations. He has also played a crucial role in assisting consulting firms throughout the project lifecycle, from the preliminary phase to the final bid, by contributing to the development of technical design criteria, project budgeting, and planning. Additionally, Mr. Yaghoubi has demonstrated expertise in corporate risk management and successfully conducted commercial negotiations and purchase order agreements.

**Shayan Yaghoubi, M.Eng., P. Eng.**
Regional Technical Sales Manager

CONTACT
shayan.yaghoubi@h2oinnovation.com
619-884-5834

- Morro Bay Water Reclamation Facility, CA | Design-build Project D… 3xRO trains each at 215 GPM permeate flow | Indirect potable reuse (IPR) application. Santa Monica Sustainable Water Infrastructure Project (Civic Center Facility), CA | Design build Project Delivery | 2xRO trains each at 0.6 MGD | Indirect potable reuse (IPR) application
- Santa Monica Sustainable Water Infrastructure Project (SMURRF Facility), CA | Design-build Project Delivery | 1xRO trains each at 0.46 MGD | Indirect potable reuse (IPR) application
- Hyperion Water Reclamation Plant, CA | Design-build Project Delivery | 2x Demonstration RO trains each at 24.5 GPM permeate flow | Indirect potable reuse (IPR) application
- Clean Water Treatment Plant (Industrial RO), TX | Design-build Project Delivery | 2x RO trains each at 0.6 MGD permeate flow | Chemical Processing application
- Complete Water Treatment Plant (Industrial Client), IA | Design-build Project Delivery | GSF + RO + Softeners (2x100%, 650 gpm each) | Boiler and Process Makeup Water
- Complete Water Treatment Plant (Industrial Client), NE | Design-build Project Delivery | MMF + RO + Softeners (2x100%, 650 gpm each) | Boiler and Process Makeup Water
- Industrial UF system, OR | Design-build Project Delivery | 3 x UF trains each at 2 MGD net filtrate flow

# APPENDIX Q

# Reference List of UF Installations

# (Envelope 1)

**ULTRAFILTRATION PROJECTS**
**REFERENCE LIST (anti-chronological order)**

## Pearland, TX, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 10.2 MGD |
| **Number of trains:** | 3 UF Trains |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2022 |

## Brandon, MB, CA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/NF |
| **Application:** | Drinking water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 7.6 MGD |
| **Number of trains:** | 4 UF Trains, 4 NF Trains |
| **Membrane supplier:** | Toray HFUG-2020AN for UF and Dow NF90 for NF |
| **Project completion date:** | 2022 |

## Innisfil, ON, CA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Phosphorous removal |
| **Type of water:** | Tertiary Effluent |
| **Capacity/Treated flow rate:** | 20.3 MGD |
| **Number of trains:** | 6 |
| **Membrane supplier:** | Toray HFUG-2020AN |
| **Project completion date:** | 2021 |

| San Diego, CA, USA | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Indirect Potable Reuse |
| **Type of water:** | Tertiary Effluent + Ozone + BAC |
| **Capacity/Treated flow rate:** | 40 MGD |
| **Number of trains:** | 12 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2021 |

| Valencia, CA, USA | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Water Reuse |
| **Type of water:** | Tertiary Effluent |
| **Capacity/Treated flow rate:** | 10.3 MGD |
| **Number of trains:** | 6 |
| **Membrane supplier:** | Dow 2880 |
| **Project completion date:** | 2020 |

## Las Virgenes, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/RO research facility |
| **Application:** | Water reclamation |
| **Type of water:** | Secondary Effluent |
| **Capacity/Treated flow rate:** | 100 gpm |
| **Number of RO trains:** | 3 UF trains and 3 RO Trains |
| **Membrane Supplier:** | Accommodates all major manufacturers |
| **Project completion date:** | 2020 |
| **Picture** |   |

## Lebanon, OR, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface |
| **Capacity/Treated flow rate:** | 4.5 MGD |
| **Number of trains:** | 4 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2019 |
| **Picture** |  |

## Englishman River, BC, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface |
| **Capacity/Treated flow rate:** | 4.2 MGD |
| **Number of trains:** | 4 trains 1st stage, 1 train 2nd stage |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2019 |
| **Picture** |  |

## Sherman, TX, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Lake Texoma |
| **Capacity/Treated flow rate:** | 11.3 MGD (expandable to 16.9 MGD) |
| **Number of trains:** | 5 |
| **Membrane supplier:** | Toray |
| **Project completion date:** | 2019 |
| **Picture** |  |

## Boyer River, AB, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/NF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water, high TOC |
| **Capacity/Treated flow rate:** | 0.14 MGD |
| **Number of trains:** | 2 UF Trains, 2 NF Trains |
| **Membrane supplier:** | Dow (UF 2880 & NF90-400) |
| **Project completion date:** | 2019 |
| **Picture** |  |

## John D'Or Prairie, AB, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/NF |
| **Application:** | Drinking Water |
| **Type of water:** | Well Water |
| **Capacity/Treated flow rate:** | 0.3 MGD |
| **Number of trains:** | 2 UF Trains, 2 NF Trains |
| **Membrane supplier:** | Dow (UF 2880 & NF90-400) |
| **Project completion date:** | 2019 |
| **Picture** |  |

## Meander River, AB, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/NF |
| **Application:** | Drinking Water |
| **Type of water:** | Well Water, high iron and manganese |
| **Capacity/Treated flow rate:** | 0.14 MGD |
| **Number of trains:** | 2 UF Trains, 2 NF Trains |
| **Membrane supplier:** | Dow (UF 2880 & NF90-400) |
| **Project completion date:** | 2019 |
| **Picture** |  |

## Williams Lake, NY, USA

| | |
|---|---|
| **Market:** | Commercial |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 0.1 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Nanostone |
| **Project completion date:** | 2021 |

## Innisfil, ON, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Potable Water Treatment, Two-Stage UF (Retrofit) |
| **Type of water:** | Surface water |
| **Capacity/Treated flow rate:** | 10 MGD (Expandable to 22.5 MGD) |
| **Number of trains:** | 4 trains 1st stage, 2 trains 2nd stage |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2018 |
| **Picture** |  |

## Confidential Client, IA, USA

| | |
|---|---|
| **Market:** | Ethanol |
| **Project type:** | UF |
| **Application:** | Cooling Tower Water |
| **Type of water:** | Surface water and secondary effluent |
| **Capacity/Treated flow rate:** | 0.19 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Nanostone |
| **Project completion date:** | 2018 |
| **Picture** |  |

## Confidential Client, OR, USA

| | |
|---|---|
| **Market:** | Industrial |
| **Project type:** | UF |
| **Application:** | Data Center Cooling |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 1.7 MGD |
| **Number of trains:** | 3 |
| **Membrane supplier:** | Dow 2880-XP |
| **Project completion date:** | 2018 |
| **Picture** |  |

## Raspberry Falls, VA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Well Water |
| **Capacity/Treated flow rate:** | 0.45 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2018 |
| **Picture** |  |

## Montevina, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking water |
| **Type of water:** | Treating settled water from surface water supply |
| **Capacity/Treated flow rate:** | 30 MGD |
| **Number of trains:** | 7 |
| **Membrane supplier:** | BASF/inge dizzer XL 09 MB70 |
| **Project completion date:** | 2018 |
| **Picture** |  |

## Ronan, MT, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 0.86 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2018 |
| **Picture** |  |

## Confidential Client, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | UF - Turnkey project including building |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 0.8 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Hydranautics HydraCapMax 80 |
| **Project completion date:** | 2018 |
| **Picture** |  |

## Northport Point, MI, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 62.5 gpm |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2017 |
| **Picture** |  |

## Carlsbad, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Water Reuse |
| **Type of water:** | Secondary effluent |
| **Capacity/Treated flow rate:** | 3.43 MGD |
| **Number of trains:** | 3 |
| **Membrane supplier:** | Toray HFU 2020N |
| **Project completion date:** | 2016 |
| **Picture** |  |

## Fort-Irwin, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/RO – Direct-coupled |
| **Application:** | Brine Concentration |
| **Type of water:** | Softened EDR Concentrate |
| **Capacity/Treated flow rate:** | 360 gpm |
| **Number of trains:** | 5 UF Trains and 3 RO Trains |
| **Membrane supplier:** | Hydranautics (HydraCapMax 80 and SWC4 Max) |
| **Project completion date:** | 2016 |
| **Picture** |  |

## Barrier Lake, AB, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF - Turnkey project including building |
| **Application:** | Drinking Water |
| **Type of water:** | Kananaskis River |
| **Capacity/Treated flow rate:** | 32 gpm |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray |
| **Project completion date:** | 2015 |
| **Picture** |  |

## West Deptford, NJ, USA

| | |
|---|---|
| **Market:** | Power |
| **Project type:** | UF |
| **Application:** | Pretreatment to RO System |
| **Type of water:** | Industrial Wastewater |
| **Capacity/Treated flow rate:** | 0.4 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2015 |
| **Picture** |  |

## West Basin, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Research Pilot |
| **Type of water:** | Secondary clarifier effluent from municipal WW plant |
| **Capacity/Treated flow rate:** | 100 gpm |
| **Number of trains:** | 3 |
| **Membrane supplier:** | Accommodates all major membrane suppliers |
| **Project completion date:** | 2015 |
| **Picture** |  |

## Clifton, CO, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking water |
| **Type of water:** | Treating settled water from surface water supply |
| **Capacity/Treated flow rate:** | 12 MGD |
| **Number of trains:** | 8 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2015 |
| **Picture** |  |

## Freeport, Indonesia

| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | UF/NF |
| **Application:** | Potable Water Treatment |
| **Type of water:** | Surface water runoff |
| **Capacity/Treated flow rate:** | 5 gpm |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2015 |
| **Picture** |  |

## Confidential Client, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | UF/RO - Turnkey project including building |
| **Application:** | Drinking Water at Workers' Camp |
| **Type of water:** | Well Water |
| **Capacity/Treated flow rate:** | Drinking Water: 2 x 105 gpm |
| **Number of trains:** | 2 UF trains and 2 RO trains |
| **Membrane supplier:** | Dow IntegraFlo |
| **Project completion date:** | 2015 |
| **Picture** |  |

## Cambria, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | Containerized UF/RO |
| **Application:** | Desalination |
| **Type of water:** | Combined groundwater + seawater |
| **Capacity/Treated flow rate:** | 0.75 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2014 |
| **Picture** |  |

## West Basin, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | Containerized UF |
| **Application:** | Wastewater treatment |
| **Type of water:** | Secondary clarifier effluent from municipal plant |
| **Capacity/Treated flow rate:** | 1 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2014 |
| **Picture** |  |

| Delaware, OH, USA | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/RO |
| **Application:** | Drinking water |
| **Type of water:** | Both ground water and surface water sources |
| **Capacity/Treated flow rate:** | 6.75 MGD |
| **Number of trains:** | 3 |
| **Membrane supplier:** | Toray HFU-2020 |
| **Project completion date:** | 2014 |
| **Picture** |  |

| Robson Raspberry, BC, Canada | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/UV – including onsite installation |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 1.3 MGD |
| **Number of trains:** | 3 |
| **Membrane supplier:** | Dow 2880 |
| **Project completion date:** | 2014 |
| **Picture** |  |

## Paul Gerin Center, QC, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Process Water |
| **Type of water:** | River Water |
| **Capacity/Treated flow rate:** | 50 gpm |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020 |
| **Project completion date:** | 2013 |
| **Picture** |  |

## Confidential Client, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | Greensand/UF - Turnkey project including building |
| **Application:** | Worker's Camp Drinking water |
| **Type of water:** | Well Water |
| **Capacity/Treated flow rate:** | 150 gpm |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Dow |
| **Project completion date:** | 2013 |
| **Picture** |  |

| Confidential Client, AB, Canada | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | MMF/UF/NF/UV - Turnkey project including building |
| **Application:** | Worker's Camp Drinking water |
| **Type of water:** | Athabasca River |
| **Capacity/Treated flow rate:** | 0.8 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray for UF / Dow for NF |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator – Contact information:** | Confidential Oil & Gas Customer |
| **Picture** |  |

| Wemindji, QC, Canada | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/NF |
| **Application:** | Drinking water |
| **Type of water:** | Surface water |
| **Capacity/Treated flow rate:** | 0.43 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFS-2020 |
| **Project completion date:** | 2012 |
| **Customer/Plant Operator – Contact information:** | Cree Nation of Wemindji |
| **Picture** |  |

## Emmons County, ND, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/RO |
| **Application:** | Drinking Water |
| **Type of water:** | Missouri River Water |
| **Capacity/Treated flow rate:** | 3 MGD |
| **Number of trains:** | 5 |
| **Membrane supplier:** | Dow 2860 |
| **Project completion date:** | 2012 |
| **Picture** |  |

## Confidential Client, IA, USA

| | |
|---|---|
| **Market:** | Ethanol |
| **Project type:** | UF |
| **Application:** | RO Feed Water, Plant Process Water |
| **Type of water:** | Lake Water and Domestic Waste Water Plant Effluent |
| **Capacity/Treated flow rate:** | 0.86 MGD |
| **Number of trains:** | 6 |
| **Membrane supplier:** | Dow and Motimo |
| **Project completion date:** | 2011 |
| **Picture** |  |

## San Diego, CC, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Indirect Potable Reuse |
| **Type of water:** | Secondary Effluent |
| **Capacity/Treated flow rate:** | 0.67 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020 |
| **Project completion date:** | 2011 |
| **Picture** |  |

## North Burleigh, ND, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/RO |
| **Application:** | Drinking Water |
| **Type of water:** | Groundwater under the direct influence of surface water |
| **Capacity/Treated flow rate:** | 2.12 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray-HFS 2020 |
| **Project completion date:** | 2011 |
| **Picture** |  |

| Stanton, ND, USA | |
|---|---|
| **Market:** | Power |
| **Project type:** | UF |
| **Application:** | Process |
| **Type of water:** | River Water |
| **Capacity/Treated flow rate:** | 190 GPM |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Dow 2880 |
| **Project completion date:** | 2010 |

| Tampa, FL, USA | |
|---|---|
| **Market:** | Power |
| **Project type:** | Containerized UF |
| **Application:** | Process |
| **Type of water:** | Sea Water |
| **Capacity/Treated flow rate:** | 100 GPM |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Dow 2880 |
| **Project completion date:** | 2010 |
| **Picture** |  |

| Elinor Lake, AB, Canada | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/UV |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 60 GPM |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray |
| **Project completion date:** | 2010 |
| **Picture** |  |

| NIPSCO Wheatfield, IN, USA | |
|---|---|
| **Market:** | Power |
| **Project type:** | UF |
| **Application:** | Process |
| **Type of water:** | River Water |
| **Capacity/Treated flow rate:** | 1.15 MGD |
| **Number of trains:** | 3 |
| **Membrane supplier:** | Dow |
| **Project completion date:** | 2009 |
| **Picture** |  |

| Statoil, AB, Canada | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | UF/RO |
| **Application:** | Process Water |
| **Type of water:** | Well Water |
| **Capacity/Treated flow rate:** | 88 GPM |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Hydranautics |
| **Project completion date:** | 2009 |
| **Picture** |  |

| Confidential Client, OH, USA | |
|---|---|
| **Market:** | Ethanol |
| **Project type:** | UF |
| **Application:** | Process – RO Feed Water |
| **Type of water:** | River Water |
| **Capacity/Treated flow rate:** | 0.89 MGD |
| **Number of trains:** | 6 |
| **Membrane supplier:** | Motimo |
| **Project completion date:** | 2008 |
| **Picture** |  |

## Confidential Client, IN, USA

| | |
|---|---|
| **Market:** | Ethanol |
| **Project type:** | UF |
| **Application:** | Process – RO Feed Water |
| **Type of water:** | Quarry Water |
| **Capacity/Treated flow rate:** | 0.89 MGD |
| **Number of trains:** | 6 |
| **Membrane supplier:** | Motimo |
| **Project completion date:** | 2008 |
| **Picture** |  |

## Energia Costa Azul, Mexico

| | |
|---|---|
| **Market:** | Power |
| **Project type:** | UF / SWRO |
| **Application:** | Process and Drinking Water |
| **Type of water:** | Sea Water |
| **Capacity/Treated flow rate:** | 132 GPM |
| **Number of trains:** | 3 |
| **Membrane supplier:** | Hydranautics |
| **Project completion date:** | 2008 |
| **Picture** |  |

| Confidential Client, SD, USA | |
|---|---|
| **Market:** | Ethanol |
| **Project type:** | UF |
| **Application:** | Process – RO Feed Water |
| **Type of water:** | Cooling Pond Water |
| **Capacity/Treated flow rate:** | 200 GPM |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Motimo |
| **Project completion date:** | 2007 |

| Confidential Client, SD, USA | |
|---|---|
| **Market:** | Ethanol |
| **Project type:** | UF |
| **Application:** | Process – RO Feed Water |
| **Type of water:** | River Water |
| **Capacity/Treated flow rate:** | 1.15 MGD |
| **Number of trains:** | 8 |
| **Membrane supplier:** | 6 trains Motimo & 2 trains Dow |
| **Project completion date:** | 2007 |

| Elkwood Provincial Park – Canada | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface water |
| **Capacity/Treated flow rate:** | 48 GPM |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Hydranautics – HydraCap 60 |
| **Project completion date:** | 2007 |
| **Picture** |  |

## Carmel-by-the-Sea, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Drinking water |
| **Type of water:** | Alluvial well |
| **Capacity/Treated flow rate:** | 100 GPM |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Hydranautics |
| **Project completion date:** | 2004 |

**PREFABRICATED AND CONTAINERIZED PROJECTS REFERENCE LIST**

**ULTRAFILTRATION PROJECTS**

## Membrane Manufacturer, USA

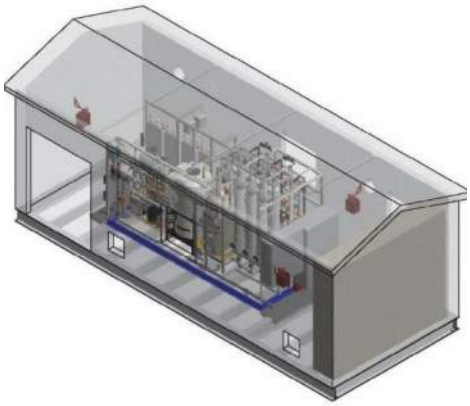
| | |
|---|---|
| **Market:** | Various |
| **Project type:** | UF |
| **Application:** | Pilot Unit |
| **Type of water:** | Seawater |
| **Capacity/Treated flow rate:** | 80,000 GPD |
| **Number of trains:** | 1 |
| **Project completion date:** | 2021 |
| **Customer/Plant Operator** | Membrane Manufacturer |

## Shell Albian, AB, Canada

| | |
|---|---|
| **Market:** | Industrial – Full scope of supply including building |
| **Project type:** | UF |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 0.8 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Hydranautics HydraCapMax 80 |
| **Project completion date:** | 2018 |
| **Customer/Plant Operator** | Shell |

## Barrier Lake, AB, Canada

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Potable & Utility Water |
| **Type of water:** | Surface |
| **Capacity/Treated flow rate:** | 23,000 GPD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | University of Calgary |



## PT Freeport, Indonesia

| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | UF/NF |
| **Application:** | Potable Water Treatment |
| **Type of water:** | Surface water runoff |
| **Capacity/Treated flow rate:** | 9,600 GPD (UF) |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Stantec Mining |

## Devon Pike, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF/UF/RO |
| **Application:** | Drinking Water Treatment at Workers' Camp |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 0.4 MGD (UF) |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Dow 2880 |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Devon Energy |

## Cambria Emergency Supply Water Project, CA, USA

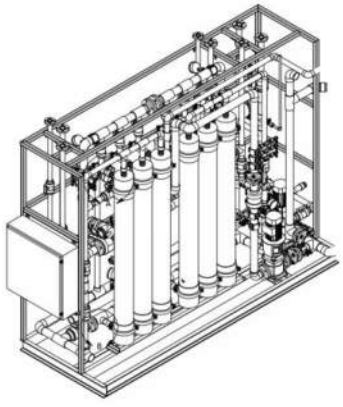
| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/RO |
| **Application:** | Drinking Water |
| **Type of water:** | Combined groundwater + seawater |
| **Capacity/Treated flow rate:** | 0.75 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2014 |
| **Customer/Plant Operator** | Cambria Community Services District |

## West Basin Municipal Water District, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF |
| **Application:** | Wastewater Reuse |
| **Type of water:** | Secondary clarifier effluent from municipal plant |
| **Capacity/Treated flow rate:** | 1 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray HFU-2020N |
| **Project completion date:** | 2014 |
| **Customer/Plant Operator** | West Basin Municipal Water District |

## Devon Jackfish, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | Greensand/UF/RO |
| **Application:** | Worker's Camp Drinking water |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 0.21 MGD (UF) |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Dow 2880 |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Devon Energy |



## Fort Hills, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | MMF/UF/NF/UV |
| **Application:** | Drinking water |
| **Type of water:** | Athabasca River |
| **Capacity/Treated flow rate:** | 0.8 MGD (UF) |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Toray HFU2020 |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Suncor |

## Seven Seas Water Corp – Tampa, FL, USA

| | |
|---|---|
| **Market:** | Power Generation - Container |
| **Project type:** | UF |
| **Application:** | Process |
| **Type of water:** | Sea Water |
| **Capacity/Treated flow rate:** | 0.14 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Dow 2880 |
| **Project completion date:** | 2010 |

## WASTEWATER PROJECTS

| Meliadine Mine, NU, Canada | |
|---|---|
| **Market:** | Industrial - Mining |
| **Project type:** | MBR |
| **Application:** | Surface Discharge |
| **Type of water:** | Municipal Sewage |
| **Capacity/Treated flow rate:** | 0.06 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Hydranautics - HSM450-HSE15 |
| **Project completion date:** | 2020 |
| **Customer/Plant Operator** | Agnico Eagle |


| ETS - Education Testing Services, NJ, USA | |
|---|---|
| **Market:** | Developers & Resorts |
| **Project type:** | Membrane Bioreactor (MBR) |
| **Application:** | Municipal sewage wastewater |
| **Capacity/Treated flow rate:** | 0.08 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Hydranautics - HSM-750-ES |
| **Project completion date:** | 2018 |
| **Customer/Plant Operator** | Education Testing Services |

## Devon Pike, AB, Canada

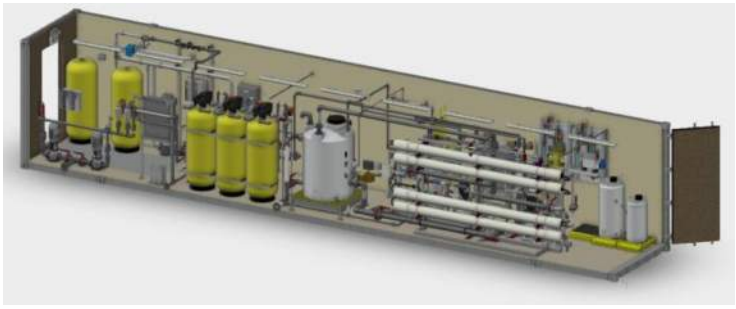
| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | MBR |
| **Application:** | Wastewater Treatment at Workers' Camp |
| **Type of water:** | Municipal Sewage |
| **Capacity/Treated flow rate:** | 0.38 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Hydranautics |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Devon Energy |

## Devon Jackfish, AB, Canada

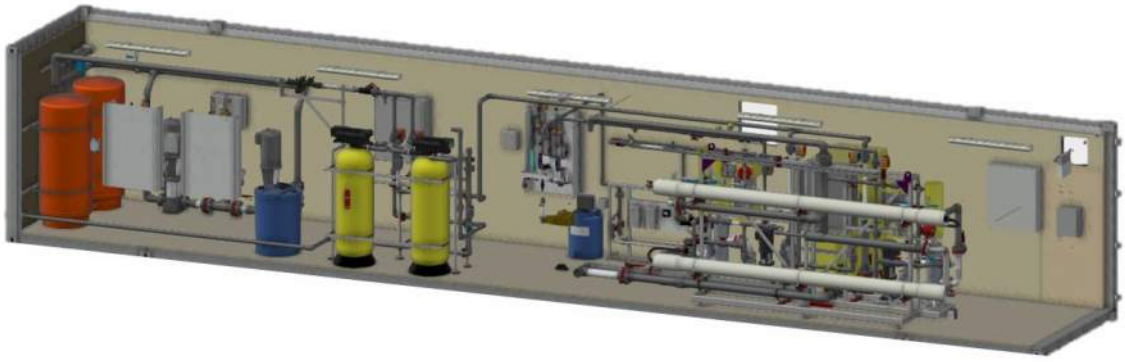
| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | BioWheel®/MBR |
| **Application:** | Worker's Camp Drinking Wastewater |
| **Type of water:** | Municipal sewage |
| **Capacity/Treated flow rate:** | 80,000 GPD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Devon Energy |

## CARTRIDGE AND MEDIA FILTRATION PROJECTS

| Fermont, QC, Canada | |
|---|---|
| **Market:** | Industrial - Mining |
| **Project type:** | MMF/NF/UV/Distribution |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 49,500 (MMF) |
| **Number of trains:** | 3 |
| **Project completion date:** | 2021 |
| **Customer/Plant Operator** | Quebec Iron Ore |



| Fermont – Camp Love, QC, Canada | |
|---|---|
| **Market:** | Industrial - Mining |
| **Project type:** | MMF/NF/UV/Distribution |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 14,000 GPD (MMF) |
| **Number of trains:** | 2 |
| **Project completion date:** | 2021 |
| **Customer/Plant Operator** | Outland/Arcelor Mittal |



## Meliadine Mine – Potable Water, NU, Canada

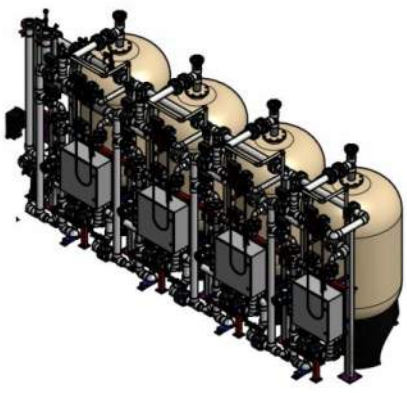
| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | Cartridge Filters/UV/Distribution |
| **Application:** | Potable water |
| **Capacity/Treated flow rate:** | 28,000 GPD |
| **Number of trains:** | 2 |
| **Project completion date:** | 2017 |
| **Customer/Plant Operator** | Agnico Eagle |

## Paramount Resources, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF/RO |
| **Application:** | Amine Make Up Water |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 27,000 GPD (GSF) |
| **Number of trains:** | 1 |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Paramount Resources |

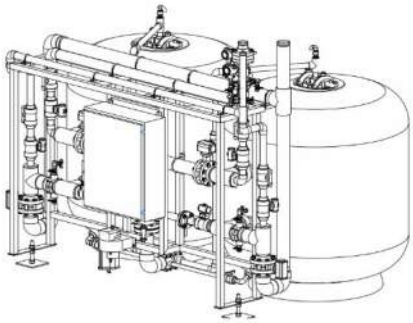
| Bruce Jack, BC, Canada | |
|---|---|
| **Market:** | Mining |
| **Project Type** | GAC |
| **Application** | Process Water |
| **Type of Water** | Mine impacted water - Nitrite removal |
| **Capacity/Treated Flow rate** | 0.86 MGD |
| **Number of trains** | 4 |
| **Project completion date** | 2015 |
| **Customer/Plant Operator** | Veolia |

| Devon Pike, AB, Canada | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF/UF/RO |
| **Application:** | Drinking Water Treatment at Workers' Camp |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 0.3 MGD (GSF) |
| **Number of trains:** | 4 |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Devon Energy |



## Devon Jackfish, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF/UF/RO |
| **Application:** | Worker's Camp Drinking water |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 0.21 MGD |
| **Number of trains:** | 2 |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Devon Energy |



## Fort Hills, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | MMF/UF/NF/UV |
| **Application:** | Drinking water |
| **Type of water:** | Athabasca River |
| **Capacity/Treated flow rate:** | 0.8 MGD (GSF) |
| **Number of trains:** | 2 |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Suncor |

## Sunshine Oil, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | MMF/RO/UV |
| **Application:** | Drinking water |
| **Type of water:** | River water |
| **Capacity/Treated flow rate:** | 28,000 GPD (MMF) |
| **Number of trains:** | 1 |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Sunshine Oil |

## Talisman Energy, AB, Canada

| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | GSF/RO |
| **Application:** | Drinking Water |
| **Capacity/Treated flow rate:** | 86,400 GPD (GSF) |
| **Number of trains:** | 3 |
| **Project completion date** | 2011 |
| **Customer/Plant Operator** | Talisman Energy |

## Northgate Minerals, ON, Canada

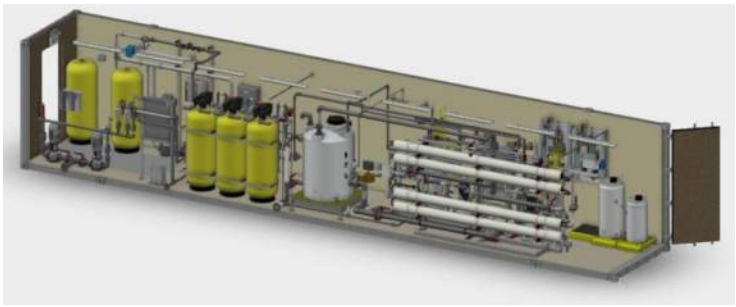
| | |
|---|---|
| Market: | Mining |
| **Project type:** | GSF/NF/UV |
| **Application:** | Drinking Water |
| **Capacity/Treated flow rate:** | 6,600 GPD (GSF) |
| **Number of trains:** | 2 |
| **Project completion date** | 2011 |
| **Customer/Plant Operator** | Northgate Mineral |

## Canadian Royalties, QC, Canada

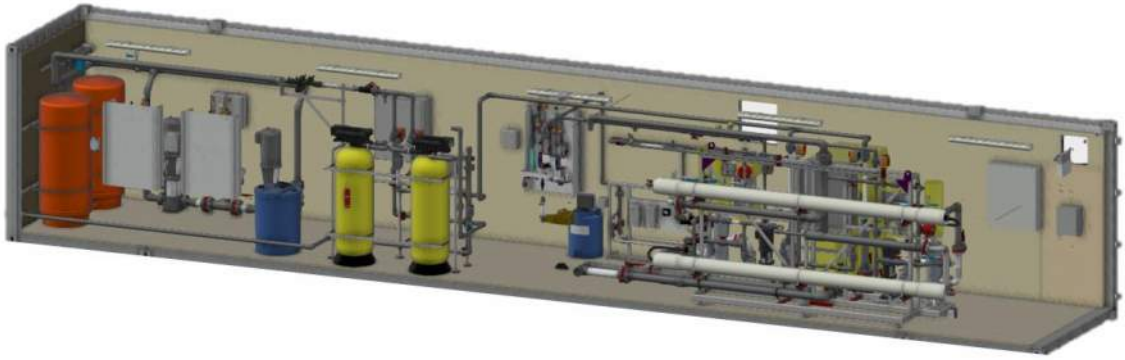
| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | MMF/NF |
| **Application:** | Drinking water |
| **Type of water:** | Lake water |
| **Capacity/Treated flow rate:** | 32,000 GPD (MMF) |
| **Number of trains:** | 1 |
| **Project completion date:** | 2008 |
| **Customer/Plant Operator** | Canadian Royalties |

**REVERSE OSMOSIS PROJECTS**

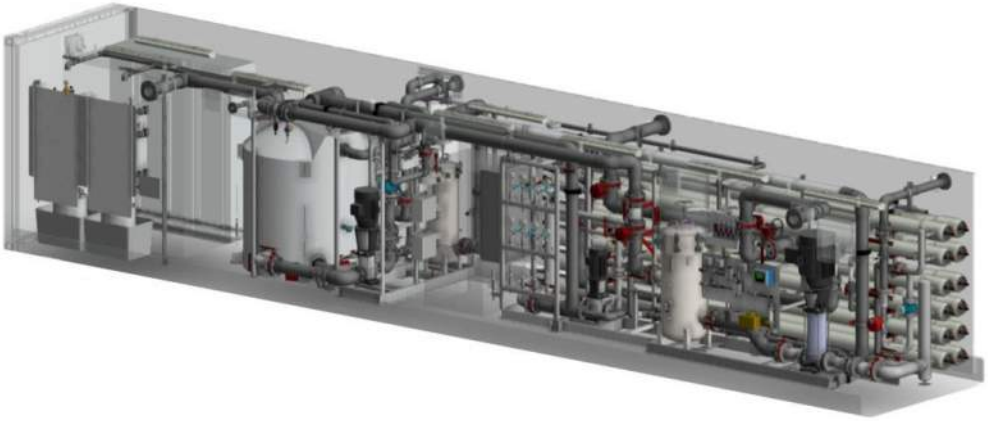
| Fermont, QC, Canada | |
|---|---|
| **Market:** | Industrial - Mining |
| **Project type:** | MMF/ NF/ UV/ Distribution |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 33,000 GPD (RO) |
| **Number of trains:** | 2 |
| **Membrane supplier:** | DuPont NF270 |
| **Project completion date:** | 2021 |
| **Customer/Plant Operator** | Quebec Iron Ore |



| Fermont – Camp Love, QC, Canada | |
|---|---|
| **Market:** | Industrial - Mining |
| **Project type:** | MMF/ NF/ UV/ Distribution |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 10,500 GPD (RO) |
| **Number of trains:** | 2 |
| **Membrane supplier:** | DuPont NF270 |
| **Project completion date:** | 2022 |
| **Customer/Plant Operator** | Arcelor Mittal |



| Santa Monica, CA, USA | |
|---|---|
| **Market:** | Municipal - Reuse |
| **Project type:** | RO |
| **Application:** | Indirect Potable Reuse |
| **Type of water:** | Blend of surface runoff and brackish groundwater |
| **Capacity/Treated flow rate:** | 0.46 MGD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray TMG20D |
| **Project completion date:** | 2022 |
| **Customer/Plant Operator** | Kiewit Infrastructure |



| Enerflex, AB, Canada | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | Double pass RO |
| **Application:** | Process Make-Up Water |
| **Type of water:** | Municipal Tap Water |
| **Capacity/Treated flow rate:** | 10,000 GPD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Hydranautics CPA7 |
| **Project completion date:** | 2019 |
| **Customer/Plant Operator** | Enerflex Ltd. |

## Paramount Resources, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF / RO |
| **Application:** | Amine Make Up Water |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 26,000 GPD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Toray |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Paramount Resources |

## PT Freeport Indonesia

| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | UF/NF |
| **Application:** | Potable Water Treatment |
| **Type of water:** | Surface water runoff |
| **Capacity/Treated flow rate:** | 7,200 GPD (NF) |
| **Number of trains:** | 1 |
| **Membrane supplier:** | UF:  Toray HFU-2020N |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Stantec Mining |

## Devon Pike, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF/UF/RO. |
| **Application:** | Drinking Water Treatment at Workers' Camp |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 0.3 MGD |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Dow |
| **Project completion date:** | 2015 |
| **Customer/Plant Operator** | Confidential Oil & Gas Customer |

## Cambria Emergency Supply Water Project, CA, USA

| | |
|---|---|
| **Market:** | Municipal |
| **Project type:** | UF/RO |
| **Application:** | Drinking Water |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 0.75 MGD |
| **Number of trains:** | 1 (RO) |
| **Membrane supplier:** | Toray |
| **Project completion date:** | 2014 |
| **Customer/Plant Operator** | Cambria Community Services District |

## Stornoway Diamond Mine, QC, Canada

| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | MMF/RO |
| **Application:** | Drinking Water |
| **Type of water:** | Surface Water |
| **Capacity/Treated flow rate:** | 0.26 MGD (RO) |
| **Number of trains:** | 2 |
| **Project completion date:** | 2014 |
| **Customer/Plant Operator** | Stornoway Diamond |

## Port-Cartier, QC, Canada

| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | MMF/RO |
| **Application:** | Drinking Water |
| **Type of water:** | River Water |
| **Capacity/Treated flow rate:** | 3,300 GPD (RO) |
| **Number of Trains** | 1 |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Arcelor Mittal |

## Fort Hills, AB, Canada

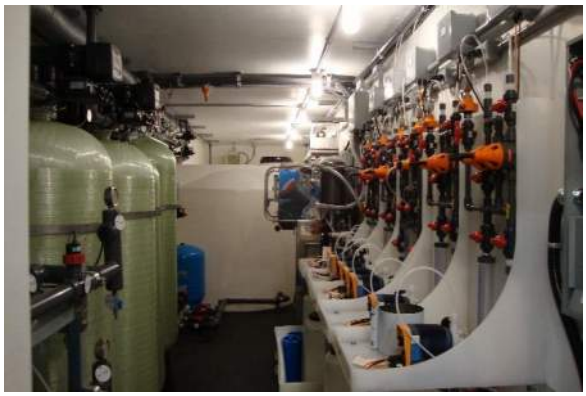
| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | MMF/UF/NF/UV. |
| **Application:** | Drinking water |
| **Type of water:** | Athabasca River |
| **Capacity/Treated flow rate:** | 0.8 MGD (NF) |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Dow |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Confidential Oil & Gas Customer |

## Devon Jackfish, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF/UF/RO |
| **Application:** | Drinking Water Treatment at Workers' Camp |
| **Type of water:** | Groundwater |
| **Capacity/Treated flow rate:** | 95,000 GPD (RO) |
| **Number of trains:** | 2 |
| **Membrane supplier:** | Dow NF90 |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Confidential Oil & Gas Customer |

## Sunshine Oil, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | MMF/RO/UV |
| **Application:** | Drinking water |
| **Type of water:** | River water |
| **Capacity/Treated flow rate:** | 28,000 GPD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | CSM |
| **Project completion date:** | 2013 |
| **Customer/Plant Operator** | Sunshine Oil |



## Talisman Energy, AB, Canada

| | |
|---|---|
| **Market:** | Oil & Gas |
| **Project type:** | GSF/RO |
| **Application:** | Process Water |
| **Capacity/Treated flow rate:** | 64,800 GPD (RO) |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Hydranautics |
| **Application** | Process Water |
| **Project completion date** | 2011 |
| **Customer/Plant Operator** | Talisman Energy |

## Northgate Minerals, ON, Canada

| | |
|---|---|
| Market: | Mining |
| **Project type:** | GSF/NF/UV |
| **Application:** | Drinking Water |
| **Capacity/Treated flow rate:** | 4,300 GPD |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Dow |
| **Project completion date** | 2011 |
| **Customer/Plant Operator** | Northgate Minerals |

## Canadian Royalties, QC, Canada

| | |
|---|---|
| **Market:** | Mining |
| **Project type:** | MMF/NF |
| **Application:** | Drinking water |
| **Type of water:** | Lake water |
| **Capacity/Treated flow rate:** | 32,000GPD (NF) |
| **Number of trains:** | 1 |
| **Membrane supplier:** | Dow |
| **Project completion date:** | 2008 |
| **Customer/Plant Operator** | Canadian Royalties |

# APPENDIX R

# Letters of Recommandation

# (Envelope 1)

**San Jose Water**
**Corporate Sustainability & Innovation**
1221A S Bascom Ave, San Jose CA 95128

February 17, 2021

Re: Letter of recommendation for $H_2O$ Innovation, Inc.

To Whom It May Concern:

BASF/inge selected $H_2O$ Innovation as their membrane integrator for San Jose Water Company's (SJWC) upgraded 30 MGD Ultrafiltration Water Treatment Plant in Los Gatos, California.

Based on the excellent performance demonstrated by $H_2O$ Innovation during the construction and startup phase of the project, under my direction, SJWC selected $H_2O$ Innovation to provide post commissioning support and consulting services for the control and maintenance of its ultrafiltration membrane modules and trains.

$H_2O$ Innovation USA, Inc. has met or exceeded all expectations set by SJWC and continues to provide excellent service and support. As a result, SJWC is pleased to recommend $H_2O$ Innovation USA, Inc. for any work similar to the services provided to SJWC.

Should you have any questions or would like to discuss the work performed by $H_2O$ Innovation for SJWC, feel free to call me to call me at 408-279-7967.

Sincerely,

Francois Rodigari
Director of Sustainability & Innovation

Cc: Ed Lambing, P.E., Chief Engineer - SJWC
Randy Houston, Water Treatment & Watershed Manager - SJWC

EST 1808
CITY OF
DELAWARE
OHIO

August 11, 2015

To Whom It May Concern;

Please accept this letter as my personal and professional recommendation of H2O Innovation as a supplier of water treatment membrane equipment for the City of Delaware Water Treatment Plant.

H2O Innovation was pre-selected by the City to be both the ultrafiltration and nanofiltration equipment manufacturer of the City's new water treatment facility. The membrane equipment was placed into operation in December 2014. The equipment has performed as designed and has met all requirements for the production and quality of potable water.

The reliability and quality of the H2O Innovation team has been very professional and has responded efficiently with their support of the membrane equipment.

H2O innovation has met or exceeded all expectations set by the City and continues to demonstrate their commitment to customer satisfaction.

Please contact me if you need any additional information regarding the quality of the equipment and staff of H2O Innovation.

Yours Sincerely,

**Thomas Hinson**
*Water Plant Manager*
*Public Utilities Department*
*740-203-1932*
*thinson@delawareohio.net*

# CLIFTON WATER DISTRICT

510 34 Road
Clifton, Colorado 81520
Office (970) 434-7328
Fax (970) 434-7338

Treatment Plant
(970) 434-5571

Laboratory
(970) 434-7624


August 11, 2015

Letter of Reference

To Whom It May Concern,
$H_2O$ Innovation (H2OI) recently delivered a 12 MGD UF membrane system using its FiberFlex™ universal rack for our Clifton Water District MF/UF Project. H2OI's scope generally included eight (8), 2 MGD UF trains, CIP equipment, blowers, compressors, instruments, system design, programming and controls, and commissioning services.

Our MF/UF Project is a complex Design Build renovation of a 1970s circa conventional water treatment facility. The project presented us with many unique engineering and commissioning challenges compared to new construction. As the District Manager for the Clifton Water District, I am pleased to report that H2OI delivered on its commitments in terms of engineering requirements, quality of manufactured components, equipment delivery schedule, and system commissioning. H2OI managed their resources and project teams efficiently during the delivery of our project as this was demonstrated through their attention to detail and ability to respond quickly to any issues that arose. Their project manager was highly responsive to the Clifton Water District and the Carollo Engineering/PCL Construction design build team.

Given the challenging conditions and timeframe, the commissioning and start-up of the ultrafiltration system was fast and efficient. H2OI deployed qualified field service representatives, programmers and water treatment professionals to ensure the commissioning process met our demanding schedule. The integration of programming and controls went extremely smooth which was a testament to the effectiveness of H2OI's quality control and Factory Acceptance Testing (FAT) procedures. Inherent with any project are items that need attention after the initial commissioning. H2OI has been responsive and efficient in attending to these items.

Overall, I have no hesitations recommending $H_2O$ Innovation and as membrane system supplier/integrator.

Sincerely,

Dale Tooker
Manager

Canadian Natural
AlbianSANDS

March 8, 2019

To Whom It May Concern,

$H_2O$ Innovation (H2OI) recently delivered a 2,960 $m^3/d$ (0.8 MGD) full scope UF membrane treatment system for our Shell Albian WTP upgrade project. H2OI's scope for this turn-key project generally included chemical pretreatment, flocculation/clarification, feed pumps, automatic strainers, ultrafiltration equipment and related ancillaries, post treatment systems, water storage structures, finished water pumping, system design, programming and controls, and commissioning services. H2OI's scope also included the new treatment plant building, supply and installation of interconnecting pipework, the MCC, and supply and installation of all power wiring.

As the former Water Treatment Specialist and CSU Operations Lead of the Albian Oil Sands upgrade project, I am pleased to report that H2OI delivered on its commitments in terms of engineering requirements, quality of manufactured components, equipment delivery schedule, and system commissioning. H2OI managed their resources and project teams efficiently during the delivery of our project as this was demonstrated through their attention to detail and ability to respond quickly to any issues that arose. Their project manager was highly responsive to CNRL's project team.

The commissioning and start-up of the clarification and ultrafiltration systems was well planned, methodical and efficient. H2OI had a qualified team of dedicated professionals that worked effectively with our staff to ensure the project's demanding schedule was met. The integration of programming and controls went extremely smooth which was a testament to the effectiveness of H2OI's quality control and Factory Acceptance Testing (FAT) procedures.

Overall, I have no hesitations recommending $H_2O$ Innovation and as membrane system supplier/integrator.

Sincerely,

Kent Proctor
Operations Coordinator
Canadian National Resources Limited

# APPENDIX S

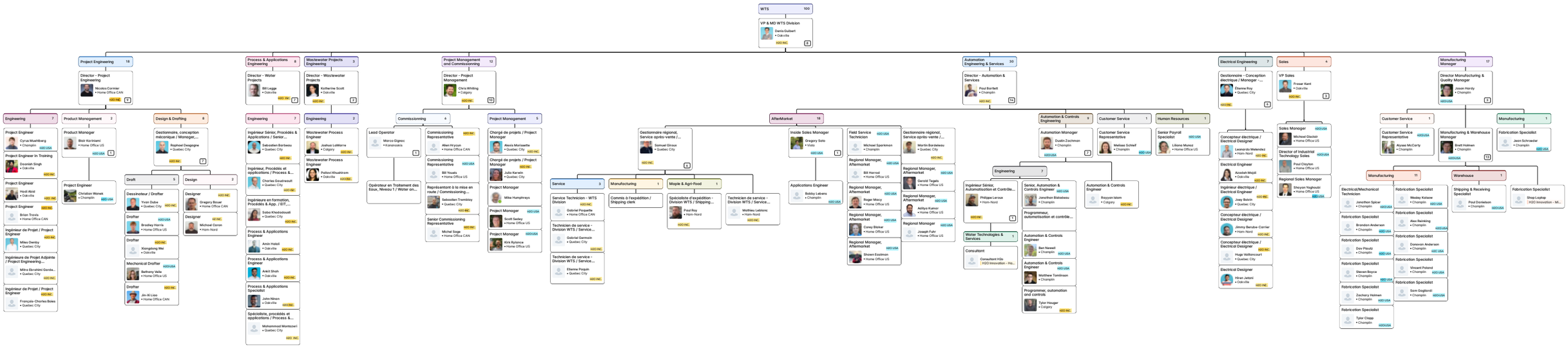
# Company Organization chart and WTS chart

# (Envelope 1)

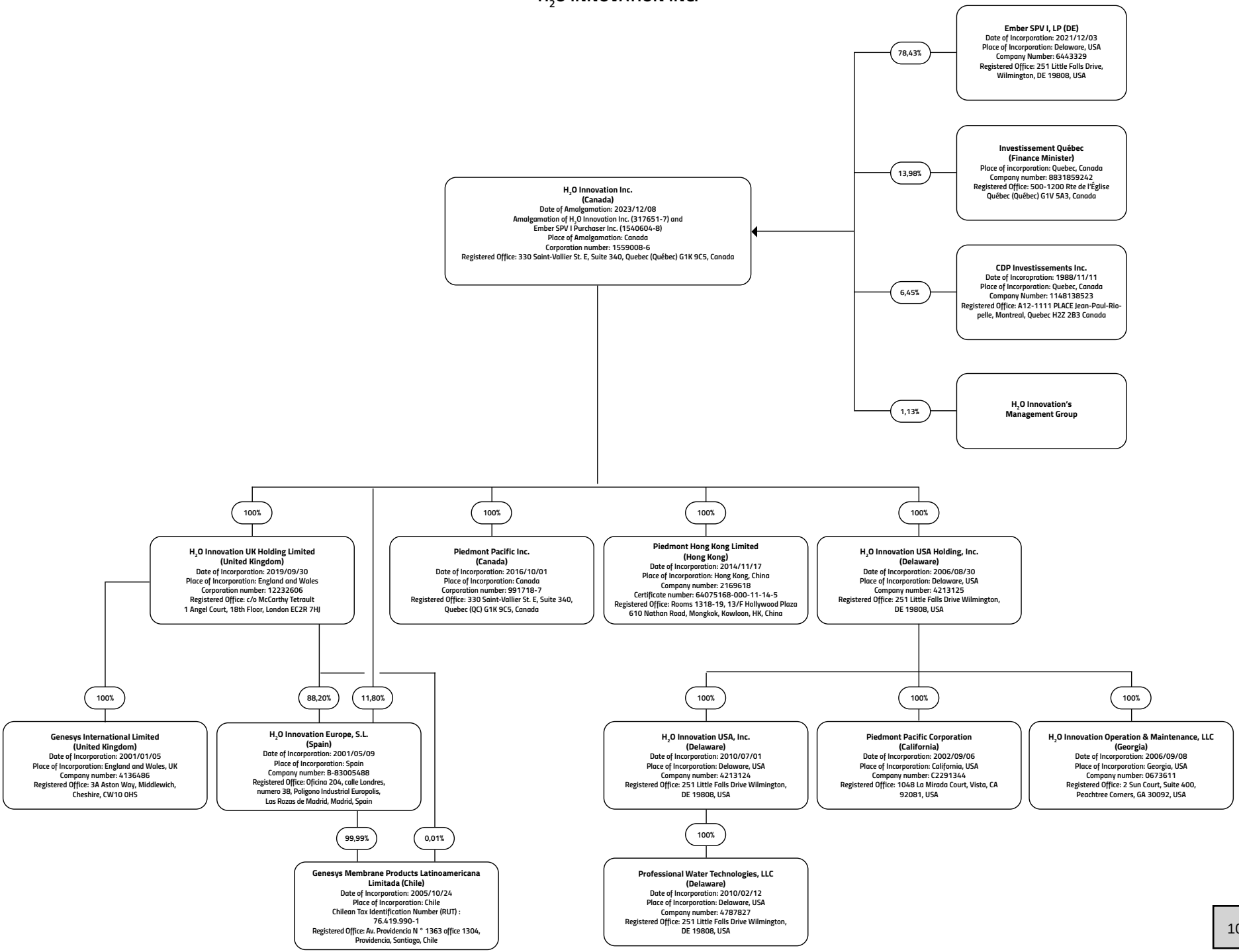
**President & CEO**
Frederic Dugre

**Chef de l'Exploitation et VP Exécutif / Chief Operating Officer**
Guillaume Clairet-Baril

**VP & MD WTS Division**
Denis Guibert



# Detailed Corporate Organizational Chart - January 2024
# $H_2O$ INNOVATION INC.



# APPENDIX T

# Oregon Health Authority

# List of Approved Membranes

# (Envelope 1)

# Alternative Treatment Technology Units Meeting Challenge Study Criteria

Oregon Administrative Rule 333-061-0050(4)(c)(I)

*Oregon Health Authority, Drinking Water Services (DWS)*

## » MEMBRANE FILTERS «

*(Other models not on this list may meet the criteria.*
*Contact DWS for details on verifications for units not listed.)*

| Manufacturer | Model | $Log_{10}$ Removal Credit | | | Maximum Flux (gfd @ 20°C) | Maximum TMP (psi @ 20°C) | Maximum Flow/Module (gpm) | Minimum Static DIT[B] Pressure (psi) | Date Verified |
|---|---|---|---|---|---|---|---|---|---|
| | | *Crypto.* | *Giardia* | Virus[A] | | | | | |
| Dow | XUSV-5203 | 3.5 | 3.5 | 0 | 60 | 30 | 23 | 30 | 2010 Feb |
| | SFD-2880XP | 4.0 | 4.0 | 0 | 70 | 24 | 41 | 19 | 2010 Dec[C] |
| | SFD-2860XP | 4.0 | 4.0 | 0 | 62 | 30 | 26 | 19 | 2010 Dec |
| | DW102-1100 | 4.0 | 4.0 | 0 | 70 | 30 | 50.2 | 30.25 | 2013 Jan[C] |
| GE Zenon | ZeeWeed 500C | 4.0 | 4.0 | 0 | 60 | 12 | 10.4 | 10.29 | 2013 Oct |
| | ZeeWeed 500D | 4.0 | 4.0 | 0 | 60 | 12 | 18.3 | 10.29 | 2013 Oct |
| | ZeeWeed 1000 V3 | 4.0 | 4.0 | 0 | 30 | 13 | 17 | 10 | 2009 July |
| | ZeeWeed 1000 V4 | 4.0 | 4.0 | 0 | 60 | 13 | 17.4 | 10 | 2013 Oct |
| BASF/inge | dizzer XL 0.9 MB 60 W | 4.0 | 4.0 | 0 | 105 | 22 | 47 | 17.5 | 2015 Sept[C] |
| | dizzer XL 0.9 MB 70 WT | 4.0 | 4.0 | 0 | 105 | 22 | 55 | 17.8 | 2015 Sept[C] |
| Pall | UNA-620A | 4.0 | 4.0 | 0 | 120 | 35 | 44 | 17.5 | 2010 Feb |
| | USV-6203 | 4.0 | 4.0 | 0 | 120 | 35 | 44 | 17.5 | 2010 Feb |
| | XUSV-5203 | 4.0 | 4.0 | 0 | 120 | 35 | 33 | 17.5 | 2010 Feb |
| Scinor | SMT 600-P50 | 4.0 | 4.0 | 0 | 120 | 43.5 | 46 | 21 | 2015 June[C] |
| | SMT 600-P80 | 4.0 | 4.0 | 0 | 120 | 43.5 | 72 | 21 | P50 equivalent |
| | SMT 600-S26 | 4.0 | 4.0 | 0 | 106 | 11 | 23.5 | 15.9 | 2016 June[C] |
| Seccua | Phoenix | 4.0 | 4.0 | 0 | 47 | 72 | 42 | 22 | 2010 Aug |
| | Virex Pro | 4.0 | 4.0 | 0 | 47 | 45 | 2.13 | 22 | 2010 Oct |

[A] Virus removal credits are not available in Oregon due to lack of a direct integrity test for virus-sized particles. All approvals and removal credits are subject to change should information indicate the model is not capable of meeting regulatory requirements.

[B] DIT = Direct Integrity Test. Acceptable pressure decay rates during a DIT are, in part, a function of system volume and must be confirmed with DWS during plan review for each installation. Additionally, minimum static pressure may be higher than listed here if backpressure is above minimums.

[C] Verification via NSF 'Public Drinking Water Equipment Performance'

For more information, please call the OHA Drinking Water Services at ph. 971-673-040 (8am-5pm PT, Mon-Fr)

# Alternative Treatment Technology Units Meeting Challenge Study Criteria

Oregon Administrative Rule 333-061-0050(4)(c)(I)

*Oregon Health Authority, Drinking Water Services (DWS)*

## » MEMBRANE FILTERS «

*(Other units not on this list may meet the criteria.*
*Contact DWS for details on verifications for units not listed.)*

| Manufacturer | Model | $Log_{10}$ Removal Credit | | | Maximum Flux (gfd @ 20°C) | Maximum TMP (psi @ 20°C) | Maximum Flow/Module (gpm) | Minimum Static DIT[B] Pressure (psi) | Date Verified |
|---|---|---|---|---|---|---|---|---|---|
| | | *Crypto.* | *Giardia* | Virus[A] | | | | | |
| Evoqua Water Technologies (formerly Siemens) | Memcor® S10N | 4.0 | 4.0 | 0 | 80 | 22 | 14.2 | 11.4 | 2015 May |
| | Memcor® S10V | 4.0 | 4.0 | 0 | 80 | 17.4 | 16.7 | 11.4[D] | 2010 Nov |
| | Memcor® L10N | 4.0 | 4.0 | 0 | 155 | 22 | 24.8 | 14 | 2012 Sept[C] |
| | Memcor® L20N | 4.0 | 4.0 | 0 | 155 | 22 | 40.4 | 15 | 2012 Sept[C] |
| | Memcor® M10C | 4.0 | 4.0 | 0 | 50 | 22 | 13 | 16.5[E] | 2019 March |
| Toray | Torayfil HFS-2020 | 4.0 | 4.0 | 0 | 120 | 29 | 47 | 18 | 2012 Mar |
| | HFU-2020N | 4.0 | 4.0 | 0 | 100 | 29 | 53.8 @ 20°C | 18.3 | 2016 Mar |
| | HFUG-2020AN | 4.0 | 4.0 | 0 | 120 | 29 | 80.75 @ 20°C | 17.44 | 2019 Nov |
| Polymem (aka Clean Membranes) | UF100XL PVDF Neophil | 4.0 | 4.0 | 0 | 60 | 21.8 | 2.7 | 16.1 | 2017 May |
| | UF80 PVDF Neophil | 4.0 | 4.0 | 0 | 60 | 21.8 | 18.9 | 16.1 | 100XL equiv. |
| | UF80G PVDF Neophil | 4.0 | 4.0 | 0 | 60 | 21.8 | 32.4 | 17.4 | 2019 Jan |
| | UF120 PVDF Neophil | 4.0 | 4.0 | 0 | 60 | 21.8 | 51.2 | 16.1 | 100XL equiv. |
| | UF240 PVDF Neophil | 4.0 | 4.0 | 0 | 60 | 21.8 | 240.5 | 17.4 | UF80G equiv. |
| | Polymem UF 120S2 | 4.0 | 4.0 | 0 | 27 | 21 | 48 | 16.3 | 2009 Aug |

[A] Virus removal credits are not available in Oregon due to lack of a direct integrity test for virus-sized particles. All approvals and removal credits are subject to change should information indicate the model is not capable of meeting regulatory requirements.

[B] DIT = Direct Integrity Test. Acceptable pressure decay rates during a DIT are, in part, a function of system volume and must be confirmed with DWS during plan review for each installation. Additionally, minimum static pressure may be higher than listed here if backpressure is above minimums.

[C] Verification via NSF 'Public Drinking Water Equipment Performance'

[D] Revised 22 March 2016 assuming contact angle of 50 degrees and backpressure of 2 psi.

[E] Assumes 2 psi backpressure and a contact angle of zero (0) degrees.

# Alternative Treatment Technology Units Meeting Challenge Study Criteria

Oregon Administrative Rule 333-061-0050(4)(c)(I)

*Oregon Health Authority, Drinking Water Services (DWS)*

## » MEMBRANE FILTERS «

*(Other units not on this list may meet the criteria.*
*Contact DWS for details on verifications for units not listed.)*

| Manufacturer | Model | $Log_{10}$ Removal Credit | | | Maximum Flux (gfd @ 20°C) | Maximum TMP (psi @ 20°C) | Maximum Flow/Module (gpm) | Minimum Static DIT[B] Pressure (psi) | Date Verified |
|---|---|---|---|---|---|---|---|---|---|
| | | *Crypto.* | *Giardia* | Virus[A] | | | | | |
| Hydranautics Nitto Group Company | HYDRAcap® Max 40 | 4.0 | 4.0 | 0 | 120 | 30 | 46.7 | Calculate[C] | 2019 Apr[D] |
| | HYDRAcap® Max 60 | 4.0 | 4.0 | 0 | 120 | 30 | 70 | Calculate[C] | Max 40 equiv. |
| | HYDRAcap® Max 80 | 4.0 | 4.0 | 0 | 120 | 30 | 94.2 | Calculate[C] | Max 40 equiv. |
| | HYDRAcap® AM 2.5 | 4.0 | 4.0 | 0 | 120 | 30 | 44.9 | Calculate[C] | Max 40 equiv. |

[A] Virus removal credits are not available in Oregon due to lack of a direct integrity test for virus-sized particles. All approvals and removal credits are subject to change should information indicate the model is not capable of meeting regulatory requirements.

[B] DIT = Direct Integrity Test. Acceptable pressure decay rates during a DIT are, in part, a function of system volume and must be confirmed with DWS during plan review for each installation. Additionally, minimum static pressure may be higher than listed here if backpressure is above minimums.

[C] The minimum static pressure for DITs must be calculated using 15.1 psi plus the back pressure on the lowest elevation of exposed fiber (based on Standard 419 results).

[D] Verification via NSF 'Public Drinking Water Equipment Performance' Standard 419 (2015)

# APPENDIX V

# Financial References

# (Envelope 1)

# Credit application and trade references

**Compagnie / Company:** $H_2O$ Innovation USA, Inc.

**Adresse de facturation:**
**Billing address:**

**$H_2O$ Innovation USA, Inc.**
8900 109th Ave N, Suite 1000
Champlin, MN 55316
Tel: 763-566-8961
Fax: 763-566-8972

www.h2oinnovation.com
info@h2oinnovation.com

**Adresse d'expédition:**
**Shipping address:**

**$H_2O$ Innovation USA, Inc.**
8900 109th Ave N, Suite 1000
Champlin, MN 55316
Tel: 763-566-8961
Fax: 763-566-8972

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**Information sur la compagnie / Company Information**

**Depuis / Since** : 1999
**Activités / Activities** : Traitement d'eau / Water treatment
**Employés / Employees** : 910
**Compagnie / Company type :** Public, Original Equipment Manufacturer (OEM)
**Tax ID / # Taxes USA:** 20-5584930

**Banque / Bank** :

***HSBC BANK USA N.A.***
Bank account: 724004971
One HSB Center Floor 18
Buffalo NY 142003

**Contact:** Jorge F.Raminez
Tel: 305-539-4946
Email : jorge.f.raminez@us.hsbc.com

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**Références / References**

Invoices by e-mail / Facturation par courriel: invoice.usa@h2oinnovation.com
Procurement contact : procurement@h2oinnovation.com

Update: 2022-01-12

***Fournisseurs / Suppliers***
***Références de crédit / Trade references***

| **Company** | **Duncan Co** |
|---|---|
| Contact | Michelle Erdmann |
| Address | 425 Hoover St NE<br>Minneapolis, MN 55413 |
| Phone | 612-331-1776 |
| Fax | 612-331-4735 |
| Email | merdmann@duncanco.com |
| Account open since | 2005 |
| Credit limit | USD 100,000 |

| **Company** | **Toray Membrane USA, Inc.** |
|---|---|
| Contact | Terry Van Koughnett |
| Address | 13435 Danielson Street<br>Poway, CA 92064 |
| Phone | 858-218-2366 |
| Fax | 858-218-2373 |
| Email | terry.vankoughnett.k3@mail.toray |
| Account open since | 2007 |
| Credit limit | USD 420,000 |

| **Company** | **Bray** |
|---|---|
| Contact | Adam Landori-Licoyannis |
| Address | 3299 Jean-Baptiste-Deschamps<br>Lachine, QC, Canada H8T 3E4 |
| Phone | 514-344-2729 #4223 |
| Fax | 514-344-3460 |
| Email | adam.landori-licoyannis@bray.com |
| Account open since | 2015 |
| Credit limit | USD 50,000 |

| **Company** | **Lumen** |
|---|---|
| Contact | Chantal Gougeon |
| Address | 4655, Autoroute 440 O.<br>Laval, QC, H7P 5P9 |
| Phone | 450-686-5396 |
| Fax | 450-682-2672 |
| Email | chantal.gougeon@lumen.ca |
| Account open since | 2004 |
| Credit limit | USD 450,000 |

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Courtier en douane / Custom Broker

***BGL Brokerage – Courtage BGL***
Contact: freight@bglbrokerage.com
Tel: 418-650-4995
Fax : 418-650-4998
Compte / Account # H2OINN

# APPENDIX W

# H2OI Quality Document

# (Envelope 1)

H02

Quality Management System

# Quality Manual

H02-0001, 01

Quality Management System
15/12/2014

# TABLE OF CONTENTS

# SECTION 1 - DOCUMENT INFORMATION

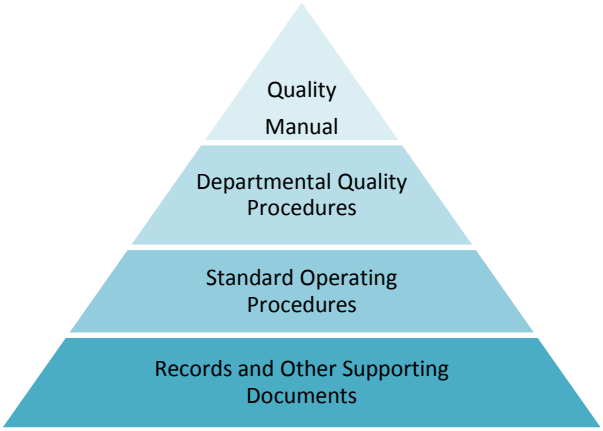
## 1.1 - OBJECTIVES OF THIS DOCUMENT

The objective of this document is to define the quality control processes in use at $H_2O$ Innovation. This manual will reference the specific procedures followed by the company and the corresponding checklists used. The roles and responsibilities in the quality management system are also defined.

## 1.2 - SCOPE

This manual and the whole Quality Management System is applicable to the proposing, designing, manufacturing, and commissioning of all water and wastewater treatment systems manufactured by $H_2O$ Innovation.

## 1.3 - QMS DOCUMENTATION STRUCTURE




Each tier references the supporting documentation below it. As the pyramid goes from top to bottom, the amount of detail and the amount of documentation both increase. Each tier acts as an index for the documents below it. The entire set of documentation is indexed in a master spreadsheet, which is kept as an internal document maintained by the Quality Document Controller.

The **Quality Manual** is the guiding document for the Quality Management System. It defines the roles and responsibilities in the system and lists the procedures followed and the checklists/reports used to verify the conformity of the system. The **Departmental Quality Procedures** describe in detail the quality procedures and the processes of the company. The **Standard Operating Procedures** include documents that describe work instructions; how tasks are to be done in step-by-step instructions. **Records and Other Supporting Documents** include the checklists used for inspections, results of quality checks and the improvements, data records, and any other necessary supporting documents.

## 1.4 - QUALITY POLICY

*$H_2O$ Innovation is committed to deliver projects on time, on budget and within strict compliance to contractual obligations and agreed engineering specifications. H2O Innovation continually seeks to improve the company's processes, productivity, and quality management system.*

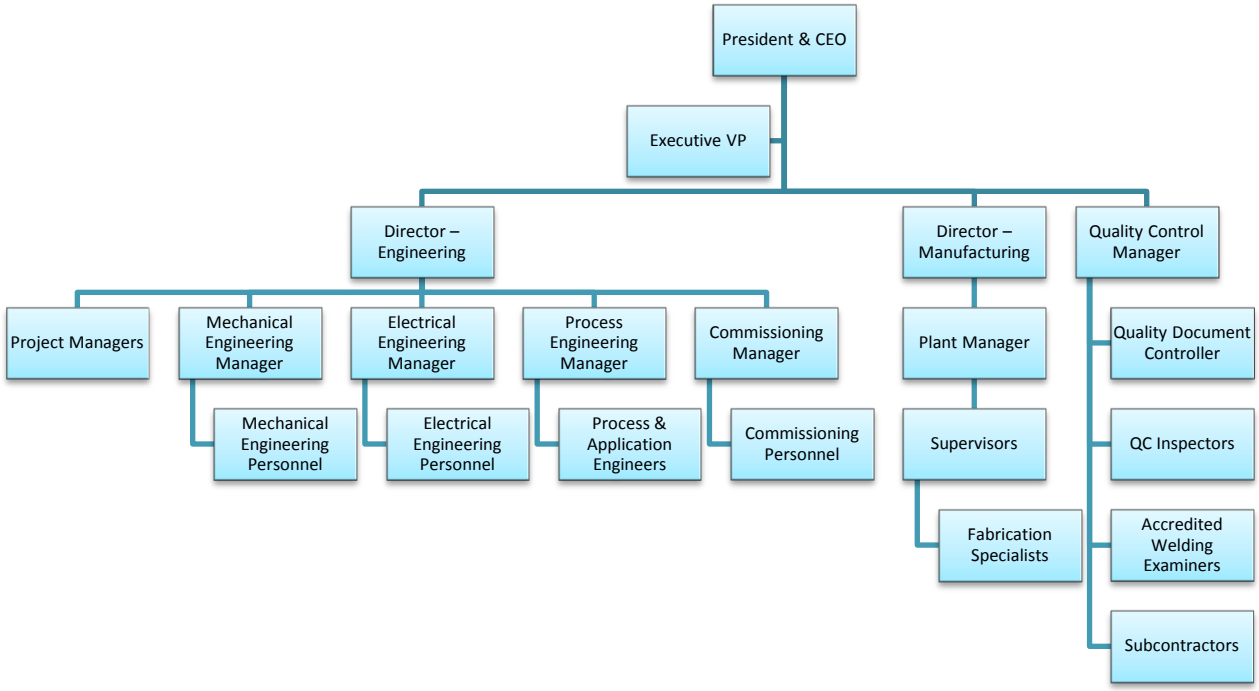
## 1.5 - COMMON ABBREVIATIONS USED AT $H_2O$ INNOVATION

| Abbreviations | Definitions |
|---|---|
| **CEO** | Chief Executive Officer |
| **CRN** | Canadian Registration Number |
| **DID** | Drawing Inspection Document |
| **GA** | General Arrangement (Drawing) |
| **MRB** | Manufacturer's Record Book |
| **MTR** | Mill Test Report |
| **NCR** | Non-conformance Report |
| **P&ID** | Piping and Instrumentation Diagram |
| **PM** | Project Manager |
| **QC** | Quality Control |
| **QID** | Quality Inspection Document |
| **QMS** | Quality Management System |
| **RFQ** | Request for Quotation |
| **SOP** | Standard Operating Procedures |
| **VP** | Vice President |

# SECTION 2 - ROLES AND RESPONSIBILITIES

## 2.1 - QC ROLE ORGANIZATIONAL CHART

*NOTE: More than one position may be held by one person.




## 2.2 - DEFINITION OF ROLES WITHIN QMS

**President and CEO** – Approves and signs the Quality Policy and Quality Objectives. Communicates the Quality Policy to all employees and provides overall guidance to the organization to uphold it.

**Executive VP** – Manages the setting of Quality Objectives. Works with the Director of Engineering and the Director of Manufacturing to implement a plan to achieve the Quality Objectives. Communicates Quality Objectives to all employees. Oversees the investigations into deviations and non-conformances.

**Director of Engineering** – Responsible for ensuring that the engineering department follows the most up-to-date procedures and abides by the Quality Policy and Quality Objectives. Responsible for communicating any changes in procedures to the engineering teams.

**Director of Manufacturing** – Responsible for ensuring that the manufacturing plants all follow the most up-to-date procedures and abides by the Quality Policy and Quality Objectives. Responsible for communicating any changes in procedures to the plant managers.

**Quality Control Manager** – Implements changes to the Quality Objectives. Has the responsibility to recognize quality related issues and seek solutions to those problems. Coordinates the quality control tasks and inspections between the various examiners/inspectors and other employees.

**Project Manager** – Manages the overall quality control for his particular project and is responsible for ensuring project quality documentation is complete and stored per the quality procedures. Suggests ways to improve the quality system and reports quality concerns on projects to the Quality Control Manager.

**Mechanical Engineering Manager** – Responsible for ensuring that the mechanical engineering personnel follow the most up-to-date procedures and are aware of and working to the Quality Policy and Quality Objectives. Responsible for communicating any changes in procedures to the mechanical engineering personnel. Owner of the mechanical engineering procedures and work instructions; must approve changes to these documents.

**Electrical Engineering Manager** – Responsible for ensuring that the electrical engineering personnel follow the most up-to-date procedures and are aware of and working to the Quality Policy and Quality Objectives. Responsible for communicating any changes in procedures to the electrical engineering personnel. Owner of the electrical engineering procedures and work instructions; must approve changes to these documents.

**Process Engineering Manager** – Responsible for ensuring that the process & application engineers follow the most up-to-date procedures and are aware of and working to the Quality Policy and Quality Objectives. Responsible for communicating any changes in procedures to the process & application engineers. Owner of the process engineering procedures and work instructions; must approve changes to these documents.

**Commissioning Manager** – Responsible for ensuring that the commissioning specialists follow the most up-to-date procedures and are aware of and working to the Quality Policy and Quality Objectives. Responsible for communicating any changes in procedures to the commissioning specialists. Owner of the commissioning procedures and work instructions; must approve changes to these documents.

**Plant Manager** – Responsible for ensuring that the most up-to-date procedures are available to plant personnel and for ensuring that employees are aware of and working to the Quality Policy and Quality Objectives. Responsible for communicating any changes in quality procedures to the plant personnel. The plant manager owns the manufacturing procedures at the plant, but must verify them with the director of manufacturing.

**Quality Document Controller** – Maintains the Quality Control Manual and the rest of the Quality Management System Documents. Updates documents when requested and communicates documentation changes to the appropriate people. Reports to the Quality Control Manager.

**Mechanical Engineering Personnel** – Responsible for following procedures and checklists within the Quality Management System and for applying the Quality Policy and keeping Quality Objectives in mind as they conduct their business. They report quality issues to their manager.

**Electrical Engineering Personnel** – Responsible for following procedures and checklists within the Quality Management System and for applying the Quality Policy and keeping Quality Objectives in mind as they conduct their business. They report quality issues to their manager.

**Process & Application Engineers** – Responsible for following procedures and checklists within the Quality Management System and for applying the Quality Policy and keeping Quality Objectives in mind as they conduct their business. They report quality issues to their manager.

**Commissioning Specialists** – Perform final checks during startup at the project site. Document nonconformities as required by the quality procedures. Responsible for following procedures within the Quality Management System and for applying the Quality Policy and keeping Quality Objectives in mind as they conduct their business. They report quality issues to their manager.

**Supervisors** – Responsible for overseeing the quality control checks and inspections during the manufacturing process. Responsible for following procedures within the Quality Management System and for applying the Quality Policy and keeping Quality Objectives in mind as they conduct their business. They report quality issues to their manager.

**Fabrication Specialists** – Responsible for following procedures within the Quality Management System and for applying the Quality Policy and keeping Quality Objectives in mind as they conduct their business. They report quality issues to their supervisor.

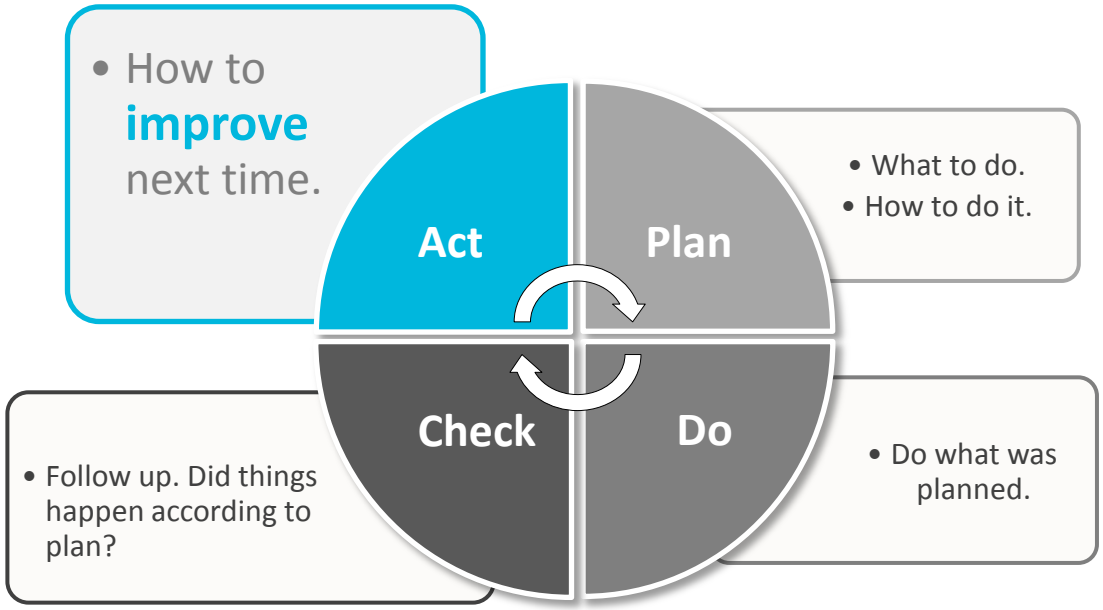
**Quality Control Inspectors** – This includes a variety of inspectors and examiners within the company who do not require certification, such as a paint examiner. Follows the appropriate procedures and checklists to perform tests. Documents nonconformities as required by the quality procedures.

**Accredited Welding Examiners** - These inspectors have the accreditations for the appropriate welding standard (CWB, AWS, ASME) required by certain projects. Responsible for maintaining their certifications. Documents nonconformities as required by the quality procedures.

**Subcontractors** – Used to do a variety of work that the company or plant either does not have the equipment or the accredited personnel to accomplish. These tasks can include painting, frame welding, pipe welding, electrical work, and NDE (Non-Destructive Examinations). Subcontractors must follow the procedures that are specified by the company.

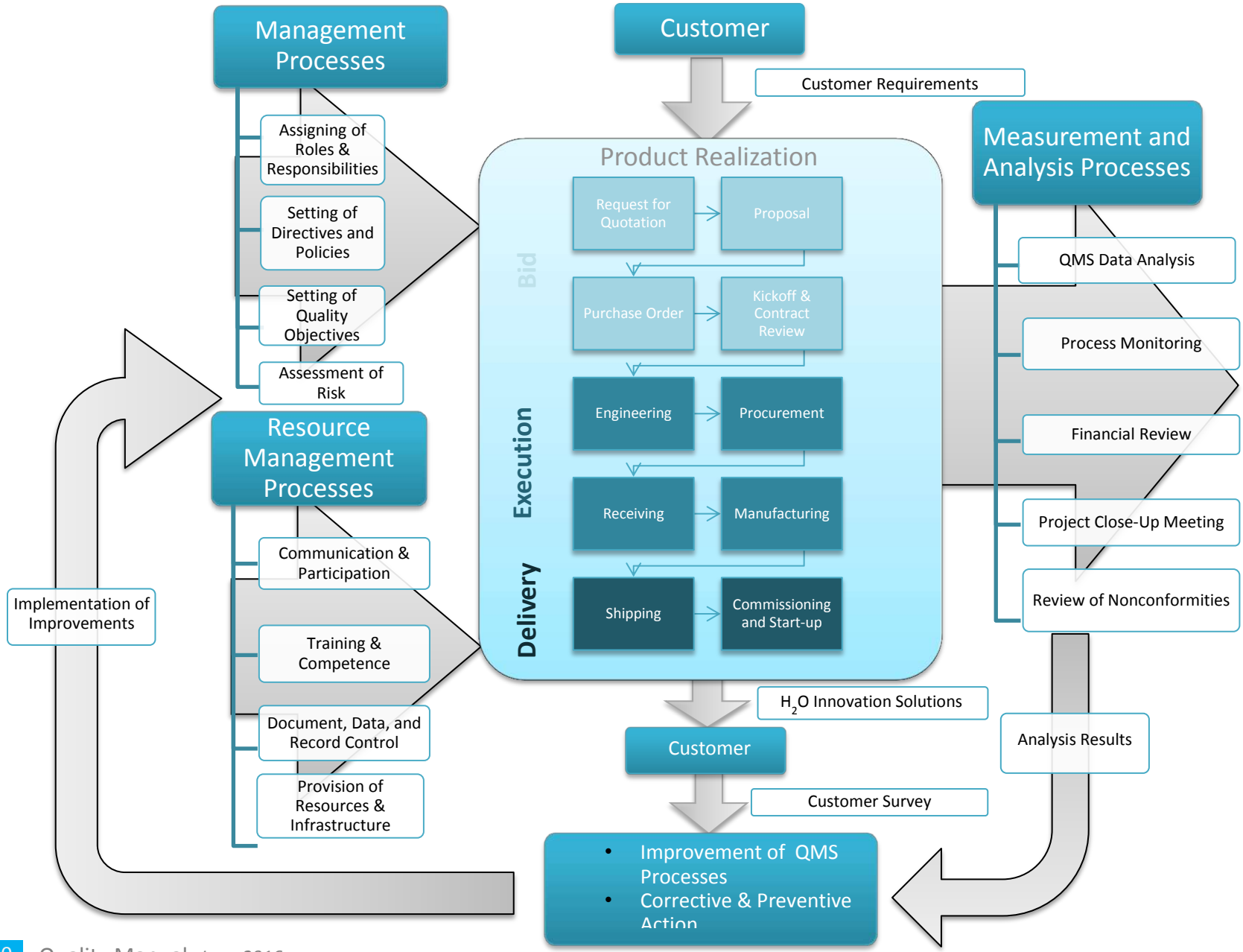
**Others** – This includes IT, Marketing, and Procurement, which each play a small role in the QMS. IT maintains electronic storage and data backup systems, which is important in record control and archiving. Marketing gathers and analyzes customer feedback through surveys. Procurement evaluates suppliers and executes purchases orders.

## SECTION 3 - QMS PROCESS




The main concept of the QMS of H2O Innovation is based on the continual cycle of improvement of the company's processes over time. The general overview of this continual cycle is shown in the diagram above. Every process in the company first needs to be planed. Then, the process is executed and analyzed. From obtained results, the processes are evaluated for any room for improvement. Those improvements will then be part of the new planning for future executions of the same processes. Changes to be made to the processes will be planned out, implemented, and evaluated. This cycle of planning, implementing, and checking is what drives improvement.

The detailed diagram below presents the same concept applied more specifically to H2O Innovation operations. This diagram also highlights how the processes interact to support one another. The processes can be split into four major categories: Supporting Processes, Customer-Related Processes, Analysis Processes, and Improvement. The supporting processes include the Management Processes and the Resource Management Processes. These enable the product realization to happen. Changes can be implemented here to improve the product realization processes and the QMS. The customer-related processes include Product Realization processes and surveys. The steps within the "Product Realization" box are a summary of the steps $H_2O$ Innovation follows when creating a water treatment system. Surveys are used to gather customer feedback and assess how the company is doing in terms of its quality and customer satisfaction. Changes in procedures are implemented here. The Analysis Processes include the review of outputs from the QMS. These help to monitor the effectiveness of the quality management system. As the diagram shows, customer feedback, nonconformities, project finances, and other outputs are reviewed. The results from these analyses are used to help determine where improvements can be made and how they can be implemented.


Management Processes
Assigning of Roles & Responsibilities
Setting of Directives and Policies
Setting of Quality Objectives
Assessment of Risk
Resource Management Processes
Communication & Participation
Training & Competence
Document, Data, and Record Control
Provision of Resources & Infrastructure
Implementation of Improvements
Customer
Customer Requirements
Product Realization
Bid
Request for Quotation
Proposal
Purchase Order
Kickoff & Contract Review
Execution
Engineering
Procurement
Receiving
Manufacturing
Delivery
Shipping
Commissioning and Start-up
H2O Innovation Solutions
Customer
Customer Survey
Measurement and Analysis Processes
QMS Data Analysis
Process Monitoring
Financial Review
Project Close-Up Meeting
Review of Nonconformities
Analysis Results
Improvement of QMS Processes
Corrective & Preventive Action

# SECTION 4 - DOCUMENT CONTROL

## 4.1 - DOCUMENT NUMBERING

A document numbering system is in place in order to ensure that records and procedures are organized, documents for different projects are separated, and the latest versions of a document can be determined easily. This procedure is documented so that it can be easily understood and be consistently applied throughout the company. All documents are given a unique number as defined in:

A17 – Document Numbering Procedure

As the document changes and is updated, the number is revised as defined in the procedure. This document is updated and maintained by the Quality Document Controller.

## 4.2 - DOCUMENT STORAGE

A document storage procedure is in place to define the centralized location and usage guidelines for the system where all of the current documents (project, procedural and quality related) are kept. All employees should be able to access the most recent versions and use them appropriately. Documents are stored as defined in

A18 – Document Storage Procedure

Approved, obsolete, and working files are organized as defined in the procedure. This procedure includes the storage of records. This document is updated and maintained by the Quality Document Controller.

## 4.3 - DOCUMENT AND RECORD CONTROL

Document and record controls are in place to ensure that the most updated documents are used, the changes and revision statuses are known, obsolete documents are no longer used, and records are maintained and used to verify and improve the Quality Management System. This procedure is documented in:

A19 – Document and Record Control Procedure

This document is updated and maintained by the Quality Document Controller.

# SECTION 5 - ENGINEERING

The engineering personnel are responsible for following the procedures defined in:

H12 – Engineering SOP

H13 – Inquiry to Order Engineering Process

Checks and responsibilities are defined below. These procedures are maintained by the quality document controller and approved by the engineering managers.

## 5.1 - PRE-BID CHECKS

The process engineer assigned to an RFQ completes a pre-bid checklist:

S04 – Pre-bid Checklist

This ensures that a clear understanding of specifications is obtained prior to creating the proposal. A pre-bid meeting is organized to verify the engineer's work and clarify the strategy for the bid amongst all involved plus the management team. This process is defined in H13 – Inquiry to Order Engineering Process.

## 5.2 - PROPOSAL CHECKS

These checks ensure that a proposal is done accurately to specifications and is competitive. Initial diagrams are verified by engineering according to the procedure defined in H12 – Engineering SOP. The assigned process engineer is responsible for completing the bid checklist to verify the proposal and costing. A final bid meeting is held prior to submittal to verify that the proposal and costing were done accurately and properly. The proposal must be approved by all present for it to be finalized and submitted. This process is defined in H13 – Inquiry to Order Engineering Process.

## 5.3 - ENGINEERING DESIGN CHECKS

Every design document produced during the engineering phase goes through an iterative review and revision process, defined in H12 – Engineering SOP. This process is intended to ensure that diagrams, drawings, etc. are done accurately to the customer specifications. An initial checklist (different for each type of drawing) is used to verify that the work was done accurately and properly. These checklists are completed by the appropriate engineering team, e.g. mechanical engineering personnel check the frame drawings. A meeting is held by engineering staff involved in the project plus management to verify the P&ID and GA Drawings are accurate. This is not typically necessary for other drawings. If revisions are required, engineering must make the changes and complete a revision checklist to verify the updated design document. The engineer assigned to the revisions is responsible for completing the checklists, and either his manager or the project manager must verify them. Design documents are submitted to the customer for approval through the project manager. Checklists are kept as internal records and are not submitted with the drawings. The documents are revised and resubmitted until approved.

# SECTION 6 - PROCUREMENT, RECEIVING, & STORAGE

## 6.1 - PROCUREMENT

Procurement is responsible for evaluating suppliers and executing purchase orders. This includes assessing how they can meet the company's needs, obtaining quality documentation from the supplier, checking their prices, assessing the quality of their past work, finding alternate suppliers and researching other key information.

## 6.2 - RECEIVING CHECKS

When shipments are received from suppliers or subcontractors, they are inspected. The shipments are inspected for proper content by checking with the corresponding drawings, bills of materials, or packing lists. Documentation received with the shipment is added to the MRB by the supervisor, if it is for a specific project. If work was subcontracted, such as frame painting or panel assembly, a qualified inspector from $H_2O$ Innovation must verify the quality of the work by using the appropriate inspection procedure and checklist. If an issue is discovered, the inspector is to follow the procedure defined in:

H06 – Control of Non-Conforming Products Procedure

Inspections are verified by a supervisor or by the plant manager.

## 6.3 - MATERIAL STORAGE

When materials are received, they are stored as required on a shelf or rack until they are pulled to release to fabrication.

# SECTION 7 - MANUFACTURING

All manufacturing plants at $H_2O$ Innovation follow the same procedures and use the same test reports / checklists. These are maintained by the Quality Document Controller and approved by the Director of Manufacturing. Checklists are completed by the fabrication specialist completing the work, and they are verified by their supervisor or plant manager.

## 7.1 - INSPECTION AND TEST PLAN (ITP)

$H_2O$ Innovation suggests its standard ITP for all projects.

## 7.2 - DESIGN REVIEW

Manufacturing is involved during the design phase of a project. In this phase, they are looking at the feasibility, labor required, costs, ease of assembly, etc. of the design. In addition, after receiving fabrication drawings, etc. from engineering and prior to beginning any fabrication, the manufacturing group reviews the designs. This is essentially a pre-manufacturing planning meeting to prepare the plant personnel for the project.

## 7.3 - WELDING

Welders must follow the approved welding procedure specifications. Welding done on frames and on spools (piping) is inspected and appropriate NDT is conducted and documented on the appropriate checklists:

QID-D01 Frame Inspection

QID-D09 Spool Inspection

These inspections are completed for welds done by $H_2O$ Innovation and for those done by subcontractors.

## 7.4 - SURFACE PREPARATION AND PAINTING

The surface preparation and painting done by $H_2O$ Innovation follow this procedure:

H35 – Painting and Surface Preparation Procedure

Surface preparation and painting done on external surfaces, typically only the frames, is inspected by following the report checklist:

QID-L12 Paint Inspection

These inspections are completed for painting done by H2O Innovation and for those done by subcontractors.

## 7.5 - MECHANICAL ASSEMBLY

The assembly of a system is checked by following the checklist:

QID-D06 Mechanical Assembly

The purpose of this quality check is to verify things such as supports and bolts are tight, dimensions are correct, etc.

## 7.6 - TRACEABILITY AND MILL TESTING

Mill Test Reports are required from all piping suppliers. Each piece pf piping and all fittings should be traceable back to its origin. In some cases this documentation is not available, but it should be requested in all cases and stored in the project MRB.

## 7.7 - HYDROSTATIC TESTING

Hydrostatic testing is done to verify that the piping, etc. of a system has no leaks and can support the operating pressure. The documented procedure must be followed to perform this test accurately and safely.

H04 – Hydrostatic Test Procedure

The test report is used to record the results of the test:

QID-N01 Pressure Test

## 7.8 - ELECTRICAL PANEL AND I/O TESTING

These tests verify the components of the electrical panel and the controls. The tests are done according to the checklists:

QID-L10 Electrical Panel Checklist

The results of the tests are recorded in this document:

QID-K02 I/O Test Report

## 7.9 - SHIPPING CHECKS

Prior to shipping any system, the shipping checklist must be approved:

QID-M01 – Shipping Checklist

This checklist should verify that all components are accounted for, assembled, and properly prepared for shipping. A fabrication specialist performs these checks, and their supervisor or the plant manager approves them. The manufacturing group also completes a packing list for each package shipped. The packing list is included with the shipment and should also be saved in the MRB.

## 7.10 - ACTIONS IF TEST IS FAILED

Actions are taken that are appropriate to the scale of the test failure. If it is as simple as a missing label, then it is added. The problem is easily fixed without the need of further documentation. The corrections made should be noted on the test report. If the failure is more significant, such as an improper weld, then an NCR may be required. In this case, the procedures defined in must be followed:

H06 – Control of Non-Conforming Products Procedure

## 7.11 - MANUFACTURING FINAL REVIEW

The following document is filled electronically throughout the manufacturing process and stored with the other QC documentation once fabrication is complete.

QID-R06 Manufacturing Final Review

The end goal of this is to help improve future system designs. This documents the minor problems encountered and the actions taken during manufacturing. These do not require NCRs and are mostly for internal incremental improvements and optimizations. Once fabrication is complete, manufacturing provides feedback on the design to engineering. This includes positive feedback and constructive critiques.

# SECTION 8 - COMMISSIONING

The purpose of the commissioning quality procedures is to ensure the smooth and efficient installation and commissioning of a system. The checklists help prepare the commissioning specialists and the staff onsite prior to the commissioning process and to verify that all steps are completed during the process. The checks also help the company to seek improvement in the processes. Checklists are completed by the commissioning specialists, unless noted otherwise. These checklists are kept as records in the appropriate project folder.

## 8.1 - PRIOR TO COMMISSIONING

The project manager sends a General Contractor Checklist to the general contractor onsite.

G13 – GC Water Checklist

This ensures that the basic tasks have been completed that are necessary before commissioning of the project begins. This helps prevent unnecessary delays.

The commissioning specialist completes the following checklist to prepare for the startup:

G14 - Project Startup Checklist

This acts as a guide to help the commissioning specialist get familiar with the project and the work that he will need to complete once onsite.

## 8.2 - ON SITE COMMISSIONING

The commissioning specialist completes the following checklist to ensure that some basic operations have been completed to eliminate any unnecessary or unsafe conditions onsite prior to the commissioning of the system:

G15 - Water Start Up Checklist

The Membrane Loading Preparation Checklist is a checklist of items that need to be set up or checked to ensure that the all supplies and preparations are in place to begin to load the membranes into the pressure vessels in an orderly fashion. All basic operations have been completed to eliminate any unnecessary or unsafe conditions onsite prior to loading membranes. The review of this list will help $H_2O$ Innovation determine if the site is ready for loading and startup activities. It will also help in the preparation of $H_2O$ Innovation's staff to ensure a smooth startup and eliminate any unplanned delays in membrane loading and starting up the equipment.

G16 - Membrane Loading Preparation Checklist

STARRT Cards are completed and discussed with crew members daily to ensure safety. These are completed by the commissioning specialist. These are typically only used when onsite at power plants, union or OilSands projects.

An I/O checklist is also completed onsite by the commissioning specialist, the programmer for the project, and the general contractor. This is to ensure that the correct field wiring has been completed. A hydrostatic test is also done onsite by the general contractor to ensure the system passes once additional field piping is constructed in final installation.

The G17 - Membrane System Start-up Checklist is used to make sure that all other equipment that is to work in concert with the membrane and all other ancillary equipment in the system as a whole has been reviewed. The G18 - Greensand Filter Water System Start-up Checklist is similar to the membrane system start-up checklist, but it takes into account the filtration media, when it is required.

G17 - Membrane System Start-up Checklist

G18 - Greensand Filter Water System Checklist

G19 - Customer Service Reports are records that the Commissioning Specialists complete for the client to document work onsite during their visit. These contain information for customer contact, the $H_2O$ Innovation Representative (typically commissioning specialist or project manager), summary of work done onsite, action items, and any necessary pictures and attachments.

## 8.3 - PLANT START-UP

These are the documented procedures that are followed for startup:

G11 - Procedure – Plant Disinfection Procedure

This is the general startup procedure. G20 - Procedure – Orifice Plugs is followed when orifice plugs are required for NF/RO vessels from certain suppliers. The following is followed for loading NF/RO membranes and start-up.

G21 - Procedure – Plant Start-Up

The Project Issue Tracking List is used to document outstanding issues that remain on a project as the Commissioning Specialist leaves the site of a project. It is a concise list of issues that cannot be resolved during that particular visit. These issues are addressed in a timely manner or when the next Specialist goes to site. The template can be found here:

G22 – Project Issue Tracking List

The Project Completion Agreement Certificate is used to record that major milestones on the project have been reached. The customer must sign off on these milestones. This may be completed by the project manager instead of the commissioning specialist. Template is located here:

G23 - Project Completion Agreement Certificate

### 8.4 - WASTEWATER TREATMENT

Wastewater treatment startup follows similar procedures to that of the water treatment systems. The checklists used have additional steps specific to wastewater plants to prepare for the commissioning process and to start up the plant.

## SECTION 9 - NON-CONFORMANCE

When a nonconforming action or product is discovered, the procedures are followed as defined in:

H06 – Non-conformance Procedure

A non-conformance report is completed by the one who detected the non-conformance and sent to the quality manager. Appropriate actions are taken to fix the immediate problem and to prevent future problems.

## SECTION 10 - EXTERNAL QUALITY CONTROL CHECKS

Work by subcontractors is verified, where applicable, and suppliers are checked for quality. Quality documentation received from external groups is stored in a central, controlled location. Any supplier or vendor checks or documentation specific to a project is also stored within the appropriate project files. External welders and inspectors must provide their certifications and qualified procedures. Vendors that provide metal materials will need to provide MTR and possible CRN. Contractors should provide their QMS or Safety manual. Vendors should send MSDS if they are sending chemicals. Subcontractors are required to complete the same inspection checklists if they are doing welding or painting.

# APPENDIX X

# Responsibility Inquiry Form

# (Envelope 1)

## RESPONSIBILITY INQUIRY

The City will determine responsibility of a firm prior to award and execution of a contract. In addition to this form, the City may obtain any information the City deems necessary to make the determination. The City will notify the firm of any other documentation required, which may include, but is not limited to, Oregon Department of Revenue Letter of Debt Compliance, recent profit-and-loss history; current balance statements and cash flow information; assets-to-liabilities ratio, including number and amount of secured versus unsecured creditor claims; availability of short and long-term financing; bonding capacity; insurability, credit information; material; equipment; facility and personnel information; record of performance under previous contracts; etc. The City may postpone the award of the Contract in order to complete its investigation and evaluation. Failure to promptly provide requested information and clearly demonstrate Responsibility may result in offer rejection and ineligibility of contract award.

**1.** Does your firm have available the appropriate financial, material, equipment, facility and personnel resources and expertise, or ability to obtain the resources and expertise, necessary to demonstrate the capability of the firm to meet all contractual responsibilities? YES ☑ / NO ☐.

**2.** Number of years in business providing the services/goods/equipment required under the prospective contract:

**3.** **a)** Is your firm experiencing financial distress or having difficulty securing financing? YES ☐ / NO ☑. **b)** Does your firm have sufficient cash flow to fund day-to-day operations throughout the proposed contract period? YES ☑ / NO ☐ If "YES" on question 3.a or "NO" on question 3.b, please provide additional details.

Response:

**4.** Within the last 3-year period, has your firm had one or more contracts terminated for contractor default by any federal, state or local government agency, or any lawsuits filed against it by creditors or involving contract disputes? YES ☐ / NO ☑**.** If "YES," please explain. (With regard to judgments, include jurisdiction and date of final judgment or dismissal.)

Response:

**5.** Is your firm, a major partner or major shareholder (defined as a partner or shareholder owning 10% or more of your firm), a major subcontractor (defined as receiving 10% or more of the total Contract amount), or any principal officer of your firm, major partner, major shareholder, or major subcontractor presently, or within the last 3 years has been convicted of, indicted for, or otherwise criminally or civilly charged by a governmental entity with the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of federal or state antitrust statutes relating to the submission of bids or Proposals; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property? YES ☐ / NO ☑. If "YES," indicate the jurisdiction, date of indictment, charge or judgment and names and summary of charges.

Response:

**6.** Within the last 3-year period, has your firm filed a bankruptcy action, filed for reorganization, made a general assignment of assets for the benefit of creditors, or had an action for insolvency instituted against it? YES ☐ / NO ☑. If "YES," indicate the filing dates, jurisdictions, type of action, ultimate resolution, and dates of judgment or dismissal, if applicable.

Response:

**7.** **a)** Within the last 3-year period, has your firm been notified of any delinquent Federal or State taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. YES ☐ /NO ☑. **b)** Does your firm have any liquidated and delinquent debt owed to the State or any department or agency of the State? If "YES" on 7.a or 7.b or both, please explain. YES ☐ /NO ☑

Response:

**8.** Does your firm have all required licenses, insurance and/or registrations, if any, and is the firm legally authorized to do business in the State of Oregon. YES ☑ /NO ☐. If "NO," please explain.
Response:

**9.** Within the last 3-year period, has your firm completed previous contracts of a similar nature with a satisfactory record of performance? [For purposes of this question, a satisfactory record of performance means that to the extent that the costs associated with and time available to perform a previous contract remained within your firm's control, your firm stayed within the time and budget allotted for the procurement and otherwise performed the contract in a satisfactory manner.]
YES ☑ /NO ☐. If "NO," please explain.
Response:

**AUTHORIZED SIGNATURE**
By signature below, the undersigned Authorized Representative on behalf of Bidder/Proposer certifies that the responses provided on this form are complete, accurate, and not misleading.

| | |
|---|---|
| Name of Firm: H2O Innovation USA, Inc. | RFP # (if applicable): 915138<br>Project Name: ALDER CREEK WTP UPGRADE |

| | |
|---|---|
| Authorized Signature | 4/1/2024<br>Date |
| Fraser Kent<br>Print Name | Vice President - Technology Sales<br>Title |

# ALDER CREEK WTP UPGRADE, CITY OF SANDY, OR

Inquiry No.: 2002006267 – Sandy Program Management (Envelope 2)

PROPOSAL # U5588

REVISION # 0

DATE 04/11/2024

**SUBMITTED TO**

JENNY COKER, PE
PUBLIC WORKS DIRECTOR OF ENGINEERING
39250 PIONEER BLVD.,
CITY OF SANDY, OR 97055
503.668.6927
jcoker@ci.sandy.or.us

**SUBMITTED BY**

SHAYAN YAGHOUBI
H2O INNOVATION USA, INC.
1048, LA MIRADA COURT,
VISTA, CALIFORNIA 92081
760.598.2206
Shayan.Yaghoubi@h2oinnovation.com

# Table of Contents

# SECTION 1 – COMMERCIAL OFFER

## 1.1 PRICING

$H_2O$ Innovation is pleased to submit our pricing for the scope of work described in Envelope 1.

| Items |
| --- |
| **Please refer to Appendix A of this document for the completed Proposal Pricing Form** |

- Shipping DDP jobsite (as per Incoterms 2020)
- Proposal validity is 90 days from the Proposal Closing Date

## 1.2 ADDITIVE BID ITEMS

As shown in the technical proposal of Envelope 1, the proposed Flexbox UF containers feature significant capacity expansion capability. By adding 2 modules per train (30 modules per UF trains instead of 28) and an additional UF train (4 trains instead of 3), the option offers more than 60% increased capacity (3.21 MGD rather than 2.0 MGD) while maintaining an N+1 configuration and providing 11.3% spare module spaces. Because our membrane system design is conservative in nature, we always leave at least 10% spare module space per train as a design contingency. This spare space allows ability to adjust flux in the future in the event there are unexpected surprises such as potential changes in feed water quality. This approach ensures reliable treatment performance and smooth operation for years to come. Please refer to Appendix A for the additional price to increase the capacity.

Note that the proposed additional pricing to increase the capacity assumes that if selected, this will need to be incorporated into our scope from the beginning to make sure we reflect that into our design and fabricate the equipment to satisfy the City's needs. Adding the fourth train in future would require additional labor to install the equipment as well as modifications to the connections inside the container - the cost of which is excluded from our Additive Bid Item pricing. However, we can add 2 additional modules per train (6 modules in total for the three trains) to increase the capacity in future if needed.

## 1.3 COMMERCIAL CLARIFICATIONS AND EXCEPTIONS

**With reference to SECTION 00 52 00 PROCUREMENT AGREEMENT, Article 10.01.E (page 51/276):**

Provided H2OI is selected as the successful bidder, we propose all agreed upon clarifications to be clearly stated in "Standard General Conditions for Procurement Contracts" so that they take precedence over any conflicting terms in the other contract documents as per the order of precedence stated in this section and Addendum 5. We understand that the technical and

commercial exceptions and clarifications stated in this proposal will be discussed and negotiated with the client post and will be a part of the contract documents.

**With reference to Section 6.01.A.6 (page 30/276):** We have included all the technical and commercial exceptions and clarifications in this proposal document.

**With reference to SECTION 00 52 00, Article 6.01.C (page 46/276) and SECTION 00 40 00, Article 2.07 (page 22/276):** Agree

We noticed there is a discrepancy between these sections in regard to the requested contract price validity (200 days after the effective date of agreement vs. 365 days after the effective date of agreement). We expect the “Notice to Commence Fabrication” to happen between 120 and 200 days after the effective date of the Agreement. If the “Notice to Commence Fabrication” is issued after 200 days from the effective date of the agreement (up to a maximum of 3 years), the Contract Price will be adjusted through Change Order.

We also noticed that Article 2.07 proposes CPI, while Article 6.01.C proposes PPI to address the price escalation. H2OI is proposing PPI to address such escalations, when applicable. Contract Price adjustment will be the ratio of the Producers Price Index (PPI) of the PPI of month that the “Notice to Commence Fabrication” is issued, to the PPI of 200 days after the effective date of the agreement.

**With reference to SECTION 00 52 00, Article 5.05.B.1 (page 42/276):** Agree

Exception – membrane system warranty shall commence 12 months from startup/commissioning or 18 months after equipment delivery, whichever occurs first.

Membrane module warranty shall commence when water first touches the UF modules or 6 months after shipping, whichever occurs first.

**With reference to SECTION 00 80 50 SUPPLEMENTARY CONDITIONS, Article 5.08.E (page 97/276):** Add the following statement: Agree

J: The M&W warranty shall start 12 months from startup and commissioning or 18 months after equipment delivery, whichever occurs first.

**With reference to SECTION 00 80 50 SUPPLEMENTARY CONDITIONS, Article 5.09.A (page 97/276):** Add the following statement to the end of paragraph: Agree

Unless attributable to bodily harm, willful misconduct, gross negligence or third-party claims, seller’s liability to buyer shall not exceed 100% of the contract price and neither party shall be held liable for consequential, indirect or special damages.

**With reference to SECTION 00 80 50 SUPPLEMENTARY CONDITIONS, Article 6.02.A (page 98/276):**

Please note that the Delivery is DDP jobsite instead of FOB jobsite for this project. FOB is a “sea and inland waterway” transport, and we will not ship the equipment for this project by boat.

**With reference to EJCDC STANDARD GENERAL CONDITIONS FOR PROCUREMENT CONTRACTS, Article 11.02.A:** the following statement to be added at the end of paragraph:

Agree

If the project is terminated for convenience or is suspended for more than 90 days, (by no fault of seller), seller shall be entitled to payment of all the costs and expenses incurred for work properly performed upon the date of termination or prolonged suspension, including the attributable portion of overhead already included in the contract price.

**With reference to Article 7.02.1.a (page 47/276):** We propose the following milestone payments for the pilot testing services:

Agree

- 10% upon execution of Pilot PO
- 25% upon completion of month 1 of pilot testing
- 25% upon completion of month 2 of pilot testing
- 25% upon completion of month 3 of pilot testing
- 15% upon completion of month 4 of pilot testing and submittal of final pilot summary report.

**With reference to Article 7.02.1.b (page 47/276):** We propose the following milestone payments for the Special Engineering Services:

- 10% upon execution of Special Engineering Services PO
- 40% upon first shop drawing submittal
- 40% upon second shop drawing submittal
- 10% upon approved submittal(s)

Agree

**With reference to Article 7.02.2.a (page 47/276):** We propose the following milestone payments for goods and special services:

- 20% upon execution of goods and special services PO
- 55% upon Receipt of parts, components and major equipment at H2OI’s manufacturing facility
- 15% upon delivery of goods onsite.
- 10% upon notice of substantial completion, but no later than 60 days after delivery of equipment to site.

Agree

**With reference to SECTION 00 80 50 (page 103/276):** The following statement shall read:

Modify Article 10.03A. as follows:

A. Subject to Paragraph 10.02.A., the amounts of the progress payments will be as provided in the Agreement. Buyer shall within 30 days after the invoice date ~~receipt of each invoice from Seller~~ pay the Seller. Buyer shall notify Seller promptly of any deficiency in the documentation and shall not unreasonably withhold payment.

Agree

**With reference to SECTION 00 52 00, Article 8 (page 48/276):** We propose the following change for this clause:

Subject to the provisions of Article 13 of the General Conditions, all monies not paid within 60 days after the receipt of the Seller's Application for payment shall accrue interest at the rate of eight (8) ~~6~~ percent per annum.

**With reference to SECTION 00 40 00, Article 6.01.B.3.a (page 30/276):**

Provided H2OI is required to store the UF containers at its facility resulting from buyer's reques to extend originally agreed upon delivery dates, a monthly storage fee of $3,000 will be applied.

Agree

**Section 01 74 00 - 5, paragraph 1.06B.2.a:** Clarification – our offer is based on a membrane warranty commencing the day water first touches membrane modules or 6 months after shipment (whichever comes first).

Agree - for membranes, not equipment (confirm module shipment at a later date)

## 1.4 TECHNICAL CLARIFICATIONS AND EXCEPTIONS

The following clarifications and exceptions form the basis of H2O Innovation's UF system offer:

**Clarification regarding mechanical submittals:**

Please note that for Mechanical submittals (Equipment, Instruments, and Valves) and Electrica submittals (single line diagram, network diagram, electrical schematics, and panel drawings) fo the equipment supplied by H2O Innovation will both be consolidated into two separate files with hyperlinks to the generic manufacturer datasheet and Operations & Maintenance manuals.

Agree

**Section 00 52 00, clause 1.01, page 1.** "*…and furnishing a complete set of two (2) hollow fiber membrane containers each with a firm capacity of 2.0 mgd.*" H2OI Proposed Flexbox Containers can hold more than one (1) independent train/rack (up to 2) each. The 2.0 MGD firm capacity can be met with two (2) trains/racks. Consequently, H2OI base offer includes two (2) trains in container #1 and one (1) train in container #2. The 2.0 capacity can be met with any one train out of service thus ensuring compliance with the N+1 requirement.

Agree

If the additive item offer (as outlined in section 11 30 00, clause 1.01.A.3.) is not selected, this approach enables H2OI to provide additional storage capacity for shelves, spares, dosing skids and/or chemical drums by supplying a single train instead of two in container #2, thereby utilizing the saved space effectively.

**Section 01 09 10, clause 1.2.B.7., page 1.** The space constraints within the container hinder u from fully meeting the criteria set by the Hydraulic Institute (HI) regarding pump inlet/outle velocities. H2OI has sized the various pump systems in accordance with manufacturers' requirements to avoid any cavitation, vibration, or noise issues.

Agree

**Section 01 08 00 clause 2.02, pages 2-4 & Section 01 34 00 clause 1.03.D., page 3.** Custom labeling for valves, instruments, or equipment is not included. Due to time constraints in supplying the engineering package, there would not be sufficient time to collaborate with the end user to

Agree

modify H2OI's standard tagging and labeling, which significantly affects all engineering and programming aspects of the project.

An example of tagging for equipment, valves and instruments is supplied in Appendix L – Preliminary Process & Instrumentation Diagram Drawing.

**Section 11 30 00, clause 2.03.A.2, page 24.** H2O Innovation's commercial offer is based o supplying non-certified NSF-61 piping. Many components do however have 316SS constructio and as such these materials are NSF-61 compatible since said materials are listed in Annex C c NSF/ANSI 61 as acceptable materials.

See attachment for clarification

**Section 11 30 00, clause 1.03.A.2.a, page 7.** H2O Innovation's 3-D drawing files will be provided electronically as STEP files or can be provided as DWG files which is compatible with AutoCAD The consultant shall confirm if their version of its Revit design model is able to import STEP format files and DWG format files.

Agree

**Section 11 30 00, clause 1.03.A.2.3.a, page 8, clause 2.01.A.14, page 11, and clause 2.03.A.11, page 45.** H2O Innovation's offer is based on supplying a CIP system within its UF containers that is capable of providing neutralization capability using the respective container's CIP pump, CIP tank and chemical transfer systems. A separate neutralization system is therefore not provided.

Agree

**Section 11 30 00, clause 1.03.A.2.b.2.b, page 8.** H2O Innovation's offer is based on the piping materials of construction as identified in our appended P&ID set.

Agree

**Section 11 30 00, clause 2.01.A.8, page 11.** Our offer is based on having the design, supply and installation of all interconnecting pipework and wiring not by H2O Innovation.

Agree

**Section 11 30 00, clause 2.01.A., pages 10 to 12.** Our proposal is based on the provision of two (2) sets of duplex chemical transfer pump systems (for NaOCl & Citric acid) and two (2) sets of duplex dosing systems (for NaOH & Sodium bisulfite), all loose shipped to be installed outside containers. Each duplex system will cater to both CIP systems (each container), facilitating the preparation of cleaning solutions and subsequent neutralization within the CIP tank. Additionally, a chemical day tank will be provided for each duplex system. For further clarity on our scope of supply, please consult our P&IDs in appendix L.

Agree

**Section 11 30 00, clause 2.01.A.21, page 12.** Our offer is based on including a single main control panel in each UF container. Each main control panel is outfitted with a single Allen Bradley CompactLogix PLC processor. Hot-swappable PLC systems have not been included.

Agree

With our proposed arrangement, one of the main control panels can be designated as the master.

H2O Innovation can also provide a price adder for a shelf spare PLC process upon request.

**Section 11 30 00, clause 2.01.C.2.f, page 15.** UF system recovery is calculated on a per train basis, averaged over a 24-hour period, from midnight to midnight. Instantaneous recovery calculations throughout the day are not required for UF operation and are not included.

Agree

**Section 11 30 00, clause 2.02.B.2.b, page 19.** We will be supplying P&IDs in H2O Innovation's standard format and will not be providing three-layer format P&IDs. Please refer to our appended preliminary P&ID set which forms the basis of our offer. Agree

**Section 11 30 00, clause 2.02.B.5.k, page 21.** Chemical pumps, including sodium hypochlorite and citric acid, will be provided in a pneumatically driven air diaphragm configuration (not vertica in-line centrifugal type). In addition, our neutralization chemical pumps including sodium hydroxid and sodium bisulfite, will be provided as solenoid driven chemical metering pumps. Agree

**Section 11 30 00, clause 2.02.B.6.a.3, page 22.** H2O Innovation does not rely on heating maintenance clean solutions. This requirement is unique to Pall Water. Our design and mode of operation does not require heated MC's which saves time and energy usage. Agree

**Section 11 30 00, clause 2.03.A.5.a. page 27.** Our offer is based on providing an oil-free scroll type compressor. Ingersoll Rand WS-7.5D. Screw compressor with oil are not suitable for the application in container due to space constraints. See Appendix L - Preliminary UF P&ID for details on compressor system supplied. Agree

**Section 11 30 00, clause 2.03.A.8 and clause 2.03.A.9, pages 36 to 43.** Our offer is based on supplying all butterfly valves and actuators configured as follows: Bray Series 3L lug style butterfly valves (trim as follows: ductile iron body, nylon coated ductile iron disc, 416 SS shaft and EPDM seats), and Bray Series 92 double-acting pneumatic actuators with no limit switches. Agree

**Section 01 09 10, Clause 1.2.B.7, Page 1**: Please note that We cannot comply with the HI (Hydraulic Institute) recommendations on inlet/outlet pipe lengths for pumps in containers. Th compromises that have to be made due to the size constraints mean that the installation cannot follow the ideal scenarios outlined in the HI". Agree

**SECTION 01 74 00, Clause 1.06.J.1.b.2, Page 12**: Please note we take exception to this clause and confirm that our offer is based on a baseline permeability of 7 gfd/psi at 20 degC. Prior t the end of the first year of operation, each UF train will be tested to confirm post-CIP permeability restoration to at least this aforementioned baseline value of 7gfd/psi at 20 degC. It is important to note that that terminal permeability (the value at which the UF system is no longer able to make the rated design flow) is 1.5 gfd/psi which is derived from our maximum instantaneous design flux divided by the maximum TMP (44.2 gfd/ 29 psi = 1.5 gfd/psi). Our baseline permeability of 7 gfd/psi is a very conservative value and is more than 4.5 times greater than the terminal permeability value. This ensures stable and reliable performance based on a conservative design. Agree

# APPENDIX A

# Proposal Pricing Form

# (Envelope 2)

# SECTION 00 41 00

# PROPOSAL PRICING FORM

PROJECT TITLE: Alder Creek Water Treatment Plant Upgrade (Project)

THIS BID IS SUBMITTED TO:

City of Sandy (as Buyer):
39250 Pioneer Boulevard
Sandy, OR 97055
Attn: Jenny Coker
(505) 668-6927
Jcoker@ci.sandy.or.us

The undersigned Seller having carefully examined the drawings, specifications, and all addenda thereto, and other Procurement Documents for furnishing Goods and Special Services for Project, and become familiar with all local conditions including labor affecting the cost thereof, does hereby propose to furnish all labor, mechanics, superintendence, tools, materials, equipment and all utilities, fuel, transportation, applicable taxes and duties, and services necessary to perform and complete said work, and work incidental thereto, in a workmanlike manner, as described in the Procurement Documents, in accordance with the bid prices hereinafter set forth.

Note: Unit and lump sum prices must be shown in words and figures in the proposal for each item being bid and in the event of discrepancy, the words shall control.

**Envelope 2 - Procurement of Membrane Filtration Equipment and Special Services**: Capital costs for complete Membrane System as specified in the procurement documents and drawings for the Project.

## CONTRACT PRICES FOR PROCUREMENT OF MEMBRANE FILTRATION EQUIPMENT AND SPECIAL SERVICES

### Item 1: Price for Performance Pilot Test

The Contract Price for the Pilot Study has been determined by the Buyer as fair and reasonable.

**Seventy-Five Thousand Dollars and no cents**
**($ 75,000.00)**

### Item 2: Price for Special Engineering Services

The Contract Price for Special Engineering Services has been determined by the Buyer as fair and reasonable.

**One Hundred and Twenty-Five Thousand Dollars and no cents**
**($ 125,000.00)**

### Item 3: Contract Price for Containerized Membrane Filtration Systems including

two million six hundred two thousand eight hundred eighty-eight dollars

($ 2 602 888 )

**Item 4: Total Contract Price**
*Add Items 1, 2, and 3.*

two million eight hundred two thousand eight hundred eighty-eight dollars

($ 2 802 888 )

**Item 5: Membrane Module Price***

Indicate the Membrane Module Price in current dollars as of the Proposal Opening Time.

three thousand one hundred twenty-five dollars

($ 3125 )

**Item 6: Indicate the Proposer's maximum instantaneous membrane flux (see notes)**

forty-four and two tenths Gallons/ ft2-day **(words)**

44.2 Gallons/ ft2-day **(number)**

Notes:
1). Maximum membrane flux shall be calculated using the feed side of the membrane proposed by the Proposer as an instantaneous value. Any proposal with maximum membrane flux exceeding 60.0 gallons/ ft2-day will be rejected by the Buyer.

2). Maximum membrane flux does not include the contractual requirements for redundancy and reliability.

**Item 7: Indicate the number of membrane modules per membrane unit proposed**

TWENTY-EIGHT **(words)**

28 **(number)**

**Item 8: Membrane Module Warranty Period***

Per Paragraphs 2.08 and 2.09 of the Proposal Form, indicate the Membrane Module Warranty Period (Full and Pro-Rata Replacement) in months.

120 months

~~**Item 7: Membrane Module Pricing Mechanism***~~

~~Per Paragraph 2.08 of the Proposal Form, the Proposer shall indicate if membrane module pricing is fixed or variable with the CPI. Proposer shall indicate the method by writing the words "fixed membrane module price" or "variable with CPI membrane module price" in the space below.~~ **[Addendum #3]**

**Item 8: Container Monthly Storage Price – Additive Bid item**

Per Paragraph 6.01 of the Proposal Form, the Proposer shall indicate pricing for monthly storage of membrane containers.

THREE THOUSAND **dollars/month**

Note: $3,000 is the monthly storage price for both containers. **($** 3000 **)**

**Item 9: Additional Capacity – Additive Bid item**

Per Paragraph 6.01 of the Proposal Form and Section 11 30 00, Containerized Hollow Fiber Membrane Equipment Membrane Treatment System, the Proposer shall indicate pricing for additional capacity.

four hundred thirty thousand one hundred twenty-eight **dollars**

Note: Please refer to section 1.2 of Envelope 2. **($** 430 128 **)**

**PERFORMANCE, PAYMENT, AND MAINTENANCE BOND**

The Undersigned agrees, if awarded the Procurement Agreement, to furnish bonds as required by the Procurement Documents for the faithful performance of the furnishing of Goods and Special Services under the Procurement Agreement.

**PROPOSAL SECURITY**

Proposal security consisting of certified check, cashier's check, or bid bond (Section 00 61 27, Proposal Bond) and made payable to Buyer, in the amount of $ 140 144, which represents five (5) percent of the Total Amount Bid, is enclosed herewith.

The proposal security accompanying this proposal shall be returned to the Seller unless, in case of the Buyer's acceptance of the Proposal, the Seller fails to execute the Procurement Agreement and submit performance and payment bonds within 15 days after its acceptance. In such a case, the Proposal Security shall become the property of the Buyer and shall be considered as payment for damages due to delay and other inconveniences suffered by the Buyer on account of such failure of the Seller. It is understood that the Buyer reserves the right to reject any and all proposals.

**RESPECTFULLY SUBMITTED ON (DATE): April 11th, 2024**

This Proposal is submitted by:

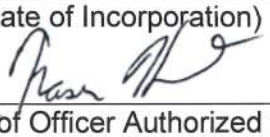
**Corporation**

H2O Innovation USA, Inc.

(Corporation Name)

Delaware

(State of Incorporation)

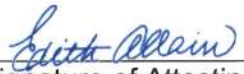


(Signature of Officer Authorized to Sign)

Fraser Kent, Vice President - Technology Sales

(Printed or Typed Name and Title of Officer Authorized to Sign)

(CORPORATE SEAL)



(Signature of Attesting Party)

Edith Allain - Corporate Secretary

(Printed or Typed Name of Attesting Party)

8900, 109th Ave N, suite 1000, Champlin, MN 55316 United States

(Corporation Business Address)

763.566.8961

(Phone No.)

Shayan Yaghoubi

(Person to Whom Notices and Correspondence Regarding This Proposal Should Be Addressed)

1048 La Mirada Ct, Vista, CA 92081 United States

(Corporation Business Address)

619.884.4834 shayan.yaghoubi@h2oinnovation.com

(Phone No. and Email Address)

**END OF SECTION**

## Odell, Adam

**From:** Shayan Yaghoubi <shayan.yaghoubi@h2oinnovation.com>
**Sent:** Thursday, June 6, 2024 11:04 AM
**To:** Odell, Adam
**Subject:** RE: Sandy - NSF 61

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Adam,

I just checked with our team, and our clarification could have been improved as it's a bit confusing. It should read as follows:

*"H2O Innovation's commercial offer is based on supplying stainless steel piping that has not been specifically tested under NSF61. Within the NSF/ANSI 61 standard, Annex C lists the "materials that shall not be required to undergo extraction testing for material-specific analytes of interest". The formulations of 304/316 Stainless steel are listed in the standard as acceptable materials and our offer is based on using this generic alloy approval to be considered NSF 61 material."*

All the PVC we use is NFS61, and we don't need to upgrade the PVC material since they are already NSF-61 certified.

**3.4 Products manufactured from Annex C acceptable materials**

Products manufactured entirely from Annex C materials shall not be required to undergo extraction testing for material-specific analytes of interest. However, extraction testing for contaminants contributed by processes specific to a production site shall be considered formulation-dependent analytes. Annex C contains the evaluation requirements for qualification as an acceptable material.

Table C1 – Acceptable materials

| Material | Specific designation | Standard (product) reference | Surface-area-to-volume ratio | End-use temperature | Composition |
|---|---|---|---|---|---|
| stainless steel | UNS S30400 (Type 304) | ASTM A 312<br>ASTM A 269<br>ASTM A 240 | 3,484 $cm^2/L$ (540 $in^2/L$) | 30 °C (86°F)<br>23°C (73°F) | percent composition: carbon (0.08 max.), manganese (2.00 max.), phosphorus (0.040 max.), sulfur (0.030 max.), silicon (0.75 max.), nickel (8.00-11.0), chromium (18.0-20.0), iron (balance) |
| stainless steel | UNS S30403 (Type 304L) | ASTM A 312<br>ASTM A 269<br>ASTM A 240 | 3,484 $cm^2/L$ (540 $in^2/L$) | 30 °C (86 °F)<br>23°C (73°F) | percent composition: carbon (0.035 max.), manganese (2.00 max.), phosphorus (0.040 max.), sulfur (0.030 max.), silicon (0.75 max.), nickel (8.00-13.0), chromium (18.0-20.0), iron (balance) |
| stainless steel | UNS S31600 (Type 316) | ASTM A 312<br>ASTM A 269<br>ASTM A 240 | 3,484 $cm^2/L$ (540 $in^2/L$) | 30 °C (86 °F)<br>23°C (73°F) | percent composition: carbon (0.08 max.), manganese (2.00 max.), phosphorus (0.040 max.), sulfur (0.030 max.), silicon (0.75 max.), nickel (11.00-14.0), chromium (16.0-18.0), molybdenum (2.0-3.0), iron (balance) |
| stainless steel | UNS S31603 (Type 316L) | ASTM A 312<br>ASTM A 269<br>ASTM A 240 | 3,484 $cm^2/L$ (540 $in^2/L$) | 30 °C (86 °F)<br>23°C (73°F) | percent composition: carbon (0.035 max.), manganese (2.00 max.), phosphorus (0.040 max.), sulfur (0.030 max.), silicon (0.75 max.), nickel (10.0-15.0), chromium (16.0-18.0), molybdenum (2.0-3.0), iron (balance) |



Let me know if this clears out the confusion. Thanks.
Shayan

**Shayan Yaghoubi, M.Eng., P.Eng.**
Director of Strategic Accounts - Water Technologies and Services
**M:** 619-884-5834
www.h2oinnovation.com

**From:** Odell, Adam <adam.odell@stantec.com>
**Sent:** Wednesday, June 5, 2024 11:12 AM
**To:** Shayan Yaghoubi <shayan.yaghoubi@h2oinnovation.com>
**Subject:** Sandy - NSF 61



Hi Shayan,

I'm working through your clarifications and exceptions. Could you expand on this Clarification? This could be a problem for us as it's in direct conflict with Oregon Administrative Rules:

> **Section 11 30 00, clause 2.03.A.2, page 24.** H2O Innovation's commercial offer is based on supplying non-certified NSF-61 piping. Many components do however have 316SS construction and as such these materials are NSF-61 compatible since said materials are listed in Annex C of NSF/ANSI 61 as acceptable materials.

316SS will suffice.

PVC downstream of the membranes will need to be NSF certified.

Thank you

**Adam Odell** PE
Civil/Mechanical Engineer

Stantec
601 SW Second Avenue Suite 1400
Portland OR 97204-3128
Phone: 503-220-5409
Cell: 503-867-0568

**CITY OF SANDY**

**SPECIFICATIONS FOR**

**ALDER CREEK WATER TREATMENT PLANT UPGRADE**

**PROFESSIONAL OF RECORD CERTIFICATION(s):**

| | |
|---|---|
| Adam Odell | I declare the Technical Specification(s) listed in the Specification TOC are applicable to the design for the subject project for the City of Sandy were prepared by me or under my supervision.<br>  |

# Table of Contents
## City of Sandy
## Alder Creek Water Treatment Plant Upgrade

## SECTION 00 10 00

## REQUEST FOR PROPOSALS

1. The City of Sandy requests Proposals for membrane equipment for its upgraded water treatment plant. Sealed Proposals, following a "two-envelope" approach outlined in Section 00 40 00, will be accepted until **2:00 PM Pacific Time on March 14th, 2024 "Proposal Closing Time." Proposals received after the deadline will not be accepted.** Further detail is found in Section 00 20 00, Instructions to Proposers, which is a part of this Request for Proposals. The anticipated schedule may be changed as needed.

| Activity | Date(s) |
|---|---|
| **Advertisement of RFP** | 02/14/24 |
| **Respondents to submit Proposals** | 03/14/24 |
| **City to review qualifications** | 03/27/24 |
| **City to issue Notice of Intent to Award (NOI)** | 04/04/24 |
| **Contract Negotiations Completed** | 05/02/24 |
| **Anticipated Council Approval of Agreement** | 05/20/24 |
| **Notice to Proceed** | 05/27/24 |

2. One PDF copy of the Proposal Documents will be provided to pre-qualified PROPOSERS. The BUYER will not be responsible for full or partial sets of Proposal Documents, including any addenda, obtained from other sources.

3. A Pre-Proposal Conference will not be held. All questions regarding the Proposal Documents shall be submitted in writing to the BUYER at least 10 days prior to the deadline for submitting proposals. Oral statements may not be relied upon and will not be binding or legally effective.

4. A Proposal Bond or certified bank check in the amount of 5 percent of the Base Proposal shall be included with each Proposal.

5. Contract Times for commencement and completion shall be in accordance with Article 5 of the Procurement Agreement.

6. The acceptance of any Proposal shall be subject to funds approved for such purposes.

7. Proposals shall be mailed, or hand delivered to Jenny Coker, P.E., Public Works Director, City of Sandy, 39250 Pioneer Boulevard, Sandy, OR 97055. Additional information may be obtained from Ms. Coker, (503) 668-6927, Jcoker@ci.sandy.or.us, or from Stantec, 601 SW 2nd Avenue, Suite 1400, Portland, OR 97204, Attn: Adam Odell, P.E., (503) 220-5409, Adam.Odell@Stantec.com. The outside of the envelope or box should be marked: "MEMBRANE PROPOSAL ENCLOSED."

8. This Request for Proposals may be cancelled or bids may be rejected for not complying with all prescribed procedures and requirements or when it is in the best interest of the City, as determined in its sole discretion. City is not liable to any bidder for any loss or expense caused by or resulting from the cancellation or rejection of a solicitation, bid, proposal or award.

9. This project was funded in part with a financial award from the Special Public Works Fund, funded by the Oregon State Lottery and administered by the Oregon Infrastructure Finance Authority

10. Any and all bids may be rejected for good cause on a finding that it is in the public interest to do so.

Dated: February 14th, 2024

**City of Sandy, OR**
c/o Jenny Coker, PE
39250 Pioneer Blvd.
Sandy, OR 97055
(503) 668-6927
Jcoker@ci.sandy.or.us

Engineer:

**Stantec Consulting Services Inc.**
Attn: Adam Odell, P.E.
601 SW 2nd Avenue, Suite 1400
Portland, OR 97204
(503) 220-5409
Adam.Odell@Stantec.com

**END OF SECTION**

## RESPONSIBILITY INQUIRY

The City will determine responsibility of a firm prior to award and execution of a contract. In addition to this form, the City may obtain any information the City deems necessary to make the determination. The City will notify the firm of any other documentation required, which may include, but is not limited to, Oregon Department of Revenue Letter of Debt Compliance, recent profit-and-loss history; current balance statements and cash flow information; assets-to-liabilities ratio, including number and amount of secured versus unsecured creditor claims; availability of short and long-term financing; bonding capacity; insurability, credit information; material; equipment; facility and personnel information; record of performance under previous contracts; etc. The City may postpone the award of the Contract in order to complete its investigation and evaluation. Failure to promptly provide requested information and clearly demonstrate Responsibility may result in offer rejection and ineligibility of contract award.

**1.** Does your firm have available the appropriate financial, material, equipment, facility and personnel resources and expertise, or ability to obtain the resources and expertise, necessary to demonstrate the capability of the firm to meet all contractual responsibilities? YES ☐ / NO ☐.

**2.** Number of years in business providing the services/goods/equipment required under the prospective contract:

**3.** **a)** Is your firm experiencing financial distress or having difficulty securing financing? YES ☐ / NO ☐. **b)** Does your firm have sufficient cash flow to fund day-to-day operations throughout the proposed contract period? YES ☐ / NO ☐ If "YES" on question 3.a or "NO" on question 3.b, please provide additional details.

Response:

**4.** Within the last 3-year period, has your firm had one or more contracts terminated for contractor default by any federal, state or local government agency, or any lawsuits filed against it by creditors or involving contract disputes? YES ☐ / NO ☐**.** If "YES," please explain. (With regard to judgments, include jurisdiction and date of final judgment or dismissal.)

Response:

**5.** Is your firm, a major partner or major shareholder (defined as a partner or shareholder owning 10% or more of your firm), a major subcontractor (defined as receiving 10% or more of the total Contract amount), or any principal officer of your firm, major partner, major shareholder, or major subcontractor presently, or within the last 3 years has been convicted of, indicted for, or otherwise criminally or civilly charged by a governmental entity with the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of federal or state antitrust statutes relating to the submission of bids or Proposals; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property? YES ☐ / NO ☐. If "YES," indicate the jurisdiction, date of indictment, charge or judgment and names and summary of charges.

Response:

**6.** Within the last 3-year period, has your firm filed a bankruptcy action, filed for reorganization, made a general assignment of assets for the benefit of creditors, or had an action for insolvency instituted against it? YES ☐ / NO ☐. If "YES," indicate the filing dates, jurisdictions, type of action, ultimate resolution, and dates of judgment or dismissal, if applicable.

Response:

**7.** **a)** Within the last 3-year period, has your firm been notified of any delinquent Federal or State taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. YES ☐ /NO ☐. **b)** Does your firm have any liquidated and delinquent debt owed to the State or any department or agency of the State? If "YES" on 7.a or 7.b or both, please explain. YES ☐ /NO ☐

Response:

**8.** Does your firm have all required licenses, insurance and/or registrations, if any, and is the firm legally authorized to do business in the State of Oregon. YES ☐ /NO ☐. If "NO," please explain.
Response:

**9.** Within the last 3-year period, has your firm completed previous contracts of a similar nature with a satisfactory record of performance? [For purposes of this question, a satisfactory record of performance means that to the extent that the costs associated with and time available to perform a previous contract remained within your firm's control, your firm stayed within the time and budget allotted for the procurement and otherwise performed the contract in a satisfactory manner.]
YES ☐ /NO ☐. If "NO," please explain.
Response:

**AUTHORIZED SIGNATURE**
By signature below, the undersigned Authorized Representative on behalf of Bidder/Proposer certifies that the responses provided on this form are complete, accurate, and not misleading.

| Name of Firm: | RFP # (if applicable):<br>Project Name: |
|---|---|

_____
Authorized Signature Date

_____
Print Name Title

# SECTION 00 20 00 INSTRUCTIONS TO PROPOSERS

## ARTICLE 1 -- DEFINED TERMS

1.01 Terms used in these Instructions to Proposers have the meanings indicated in the General Conditions. Additional terms used in these Instructions to Proposers have the meanings indicated below which are applicable to both the singular and plural thereof:

A. Any reference or use of the word “Bid” or “Bidder” contained in the Contract Documents shall be interpreted as “Proposal” or “Proposer.”

B. The City of Sandy shall act in the role of “Buyer”, “Owner”, or “City”.

C. The Membrane System Supplier (MSS) shall act in the role of “Seller” or “Supplier.”

D. The membrane element manufacturer (MEM) shall supply membrane modules to the MSS.

## ARTICLE 2 -- COPIES OF PROPOSAL DOCUMENTS

2.01 Complete sets of the Proposal Documents shall be used in preparing Proposals including Volumes 1, 2, and 3; neither the Buyer nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

2.02 Buyer and Engineer in making copies of Proposal Documents available on the above terms do so only for the purpose of obtaining Proposals for furnishing Goods and Special Services and do not confer a license or grant for any other use.

2.03 Reproduction and/or distribution of the Proposal Documents to another party that is not directly associated with the project is strictly prohibited.

## ARTICLE 3 -- QUALIFICATIONS OF PROPOSERS

3.01 This request for Proposals is open only to pre-qualified Proposers. A Proposal may be rejected if the Proposer cannot meet the deadlines established in the Contract Documents.

A. Based on the Buyer’s review, the following MSS’s are acceptable

1. PALL Water

2. H2O Innovation

B. Based on the Buyer’s review, the following MEMs and modules are acceptable:

1. PALL (ASAHI) UNA-620A Microfiltration Membrane Module

2. Toray HGUF2020AN Ultrafiltration Membrane Module

3. No request for approved equals will be accepted for other MEMs

3.02 By issuing a Bid pursuant to this RFP, the Seller represents and warrants that it shall provide the goods and services requested in the RFP in accordance with the highest standards prevalent in the industry or business most closely involved in providing such goods and services.

3.03 If the Seller has multiple options, such as different equipment arrangements, the Seller may provide the Buyer with two Proposals. Instructions are provided in Article 11.

**ARTICLE 4 -- EXAMINATION OF PROPOSAL DOCUMENTS AND POINT OF DESTINATION**

4.01 Upon request, the Buyer will provide Proposer reasonable access to the facility location to conduct investigations, examinations, tests, and studies that Proposer deems necessary for submission of a Proposal.

4.02 Before submitting a Proposal, Proposers shall:

A. Examine and carefully study the Proposal Documents, including any Addenda and the related data identified in the Proposal Documents;

B. Become familiar with all federal, state, and local laws and regulations that may affect cost, progress, or the furnishing of Goods and Special Services;

C. Carefully study and correlate the information known to Proposer, and information and observations obtained from Proposers visits, if any, to the facility location, with the Proposal Documents;

D. Promptly give Engineer written notice of all conflicts, errors, omissions, ambiguities, or discrepancies that Proposer discovers in the Proposal Documents and obtain written confirmation from the Engineer of the resolution of the issues; and

E. Determine that the Proposal Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Special Services.

**ARTICLE 5 -- PRE-PROPOSAL CONFERENCE**

5.01 A Pre-Proposal Conference will not be held. All questions regarding the Proposal Documents shall be submitted in writing to the Buyer no later than the date indicated in Article 6 of the Instructions to Proposers. Oral statements by the Buyer or Engineer may not be relied upon and will not be binding or legally effective.

## ARTICLE 6 -- INTERPRETATIONS AND ADDENDA

6.01 All questions about the meaning or intent of the Proposal Documents are to be submitted to the Buyer in writing. Interpretations or clarifications considered necessary by the Buyer in response to such questions will be issued by addenda mailed or delivered to all parties having received the Proposal Documents. Questions received less than ten days prior to the Proposal Closing Time will not be answered. Only answers in the Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

6.02 Addenda may be issued to clarify, correct, or change the Proposal Documents.

6.03 Right to Protest: A Proposer may protest specifications or Contract terms and conditions. Protests must be in writing and delivered to the Buyer not less than 10 days prior to the Proposal closing time.

## ARTICLE 7 -- PROPOSAL SECURITY

7.01 A Proposal must be accompanied by Proposal security made payable to the Buyer, in an amount of 5 percent of the base Proposal Pricing and in the form of a certified bank check, irrevocable letter of credit issued by an insured institution acceptable to the State of Oregon, or a Proposal Bond, on the form attached, issued by a surety meeting the requirements of Paragraph 4.1.B of the General Conditions.

7.02 The Proposal security for all Proposers shall be retained until the Buyer completes the Procurement Proposal evaluation in accordance with Section 00 31 00, Proposal Evaluation. The Proposal security of the apparent successful Proposer will be retained until such Proposer has executed the agreement, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Proposal security will be returned. If the apparent successful Proposer fails to execute and deliver the agreement and furnish the required Contract security within 15 days after the Notice of Award, the Buyer may annul the Notice of Award and the Proposal security of that Proposer will be forfeited. The Proposal security of other Proposers whom the Buyer believes to have a reasonable chance of receiving the award may be retained by the Buyer until the earlier of seven days after the Procurement Proposal evaluation or 60 days after the Proposal Opening Time, whereupon the Proposal security furnished by such Proposers will be returned.

7.03 Proposal security of other Proposers whom the Buyer believes do not have a reasonable chance of receiving the award will be returned within seven days after the Proposal Opening Time.

## ARTICLE 8 -- "OR EQUAL" ITEMS

8.01 The Contract, if awarded, will be on the basis of materials and equipment, (including component equipment and Proposers equipment) specified or described in the Proposal Documents without consideration of possible "or-equal" items. Whenever it is specified or described in the Proposal Documents that an "or-equal" item of material or equipment may be furnished or used by Supplier if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the agreement. The procedure for submittal of any such application by Supplier and consideration by Engineer is set forth in the Procurement General Conditions.

8.02 Component equipment and Proposers equipment is defined in the General Conditions.

8.03 For component equipment provided by the Proposer, if the manufacturer or supplier of equipment has changed the model or component part number identified in the specifications, the current model or part number shall be used. If the manufacturer or Supplier has discontinued the model identified in the specifications, the Proposer shall base the Proposal on one of the other manufacturer(s) listed. If another manufacturer or supplier is not listed, the Proposer shall request an interpretation by the Engineer.

## ARTICLE 9 -- PREPARATION OF PROPOSAL

9.01 The Proposal Form is included with the Proposal Documents.

9.02 All blanks on the Proposal Form and Proposal Pricing Form shall be completed by printing in ink or by typewriter and the Proposal signed. A Proposal price shall be indicated for each Proposal item, alternative, or unit price item listed therein, or the words "No Proposal," "No Change," or "Not Applicable" entered. If a Proposer is requested to provide pricing on Alternatives requested by the Buyer and fails to provide such pricing, the Proposal shall be determined to be non-responsive, and shall be rejected.

9.03 A Proposal by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

9.04 All names must be typed or printed in ink below the signature.

9.05 The Proposal shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Proposal Pricing Form.

9.06 The person, address and telephone number for communications regarding the Proposal shall be shown.

9.07 Exceptions and Requests for Modifications to the Proposal Documents.

A. Proposers shall carefully review the Agreement, the Procurement General Conditions, and Warranty Sections of the Contract Documents. Proposers "Standard Terms and Conditions of Sale" will not be accepted. The Buyer will reject any Proposal that has any exceptions to the Contract Documents or any request to modify the Contract Documents.

B. The Proposer shall carefully review the provisions of the membrane warranty contained in the General Conditions and in Section 01 74 00, Membrane System and Module Warranty. Subject to the requirements of Article 15.01, the Buyer will reject any Proposal containing changes to the warranty provisions as a non-responsive Proposal.

9.08 To demonstrate Proposers Qualifications to furnish Goods and Special Services, the Proposer shall submit written evidence of the following accompanying information with the Proposal.

A. The Proposer shall provide written evidence from the surety that it can obtain the required Bonds and Insurances required by the Contract Documents.

B. The Proposer shall disclose in writing if there is any legal claim regarding a patent or other intellectual property that would affect its ability to provide the Goods or Special Services required by the Contract.

9.09 Prices offered shall include all applicable taxes and duties.

9.10 The Proposer shall submit a proposed maintenance agreement for consideration by the Buyer. The maintenance agreement shall list service types, serve type fees, labor fees, overhead rate, proposed profit margin, all charges and markups, reimbursements, and method for annual escalation. The proposed maintenance agreement shall be signed and ready for execution by the Buyer if acceptable until the time that “notice to commence fabrication” is issued.

**ARTICLE 10 -- BASIS OF PROPOSAL; COMPARISON OF PROPOSALS**

10.01 Base Proposal with Alternates

A. The “Base Proposal” is the sum stated in the Proposal for which the Proposer offers to furnish the Goods and Special Services described in the Proposal Documents as the base, to which work may be added or from which work may be deleted for sums stated in Alternate Proposals. An “Alternate Proposal” (or Alternate) is an amount stated in the Proposal that may be added or deducted to the amount of the Base Proposal if the corresponding change in the Goods and Special Services, as described in the Proposal Documents, is accepted.

B. Proposer shall submit a Proposal for the Base Proposal and indicate the amount for each Alternate described in the Proposal Documents as set forth in the Proposal Form.

C. Discrepancies between words and figures will be resolved in favor of the words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

D. The Buyer shall only evaluate Proposals that have been determined to be responsive.

**ARTICLE 11 -- SUBMITTAL OF PROPOSAL**

11.01 The Buyer shall reject any Proposal as non-responsive if the Proposal contains any information separate or prepared as an attachment to the requested information, other than the items that have been specifically requested.

A. The Proposal shall be submitted in two sealed envelopes – Envelope No. 1 and Envelope No. 2 – which shall contain the items of information listed in Section 00 40 00, Proposal Form, Article 6. If the Seller wishes to provide two Proposals, the Seller shall mark each envelope with Option 'A' or Option 'B', respectively.

11.02 Proposal must be received by the Buyer no later than the Proposal Closing Time at the place indicated in the Request for Proposals. If a Proposal is sent by mail or other delivery system, the sealed envelopes shall be enclosed in a separate envelope plainly marked on the outside with the notation "MEMBRANE PROPOSAL ENCLOSED." Inside this sealed envelope shall be the two separate sealed envelopes clearly marked as Envelope 1 and Envelope 2. A mailed Proposal shall be addressed to Jenny Coker, Public Works Director of Engineering, City of Sandy, 39250 Pioneer Blvd., Sandy, OR 97055. For clarity's sake, the Public Works Director is authorized and designated the requisite authority to receive proposals on behalf of the City.

11.03 Proposals delivered in person must be turned in prior to the Proposal Closing Time.

**ARTICLE 12 -- MODIFICATION OR WITHDRAWAL OF PROPOSAL**

12.01 A Proposal may be modified or withdrawn by a document executed in the manner that a Proposal must be executed and delivered to the place where Proposals are to be submitted prior to the Proposal Closing Time.

**ARTICLE 13 -- PROPOSALS TO REMAIN SUBJECT TO ACCEPTANCE**

13.01 All Proposals will remain subject to acceptance for the period of time stated in the Proposal Form, but the Buyer may, in its sole discretion, release any Proposal and return the Proposal security prior to the end of this period.

**ARTICLE 14 -- AWARD OF CONTRACT**

14.01 Responsiveness and Buyer's Reserved Rights

A. Proposals received by the Buyer will be reviewed for responsiveness. The Buyer reserves the right to reject any and all Proposals, including without limitation, non-conforming, unbalanced, or conditional or otherwise nonresponsive Proposals. The Buyer may also reject the Proposal of any Proposer if the Buyer believes that it would not be in the best interest of the Buyer to make an award to that Proposer. The Buyer also reserves the right but is not obligated to waive all informalities not involving price, time or changes in the Goods and Special Services. Finally, the Buyer reserves the right to reject all Proposals.

B. More than one Proposal for the same Goods and Special Services from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Proposer has an interest in more than one Proposal for the Goods and Special Services and shall be cause for disqualification of that Proposer and the rejection of all Proposals in which that Proposer has an interest.

14.02 Evaluation

A. In evaluating Proposals, the Buyer will consider whether or not the Proposals comply with the prescribed requirements, prices and other data, as may be requested in the Proposal Form or may be requested from Proposers prior to a Notice of Award.

B. The Buyer and the Engineer will evaluate responsive Proposals as described in Section 00 31 00, Proposal Evaluation. In evaluating Proposers for responsibility, consideration will be given to the financial strength and competency of the Proposer for the ability to supply the Goods and Services covered by the Contract Documents.

C. By submitting a Proposal, each Proposer agrees that the Buyer, in determining eligibility for the award, may consider the Proposers conduct and performance under other Contracts, financial condition, and other factors, including claims against, the Proposer, which could affect the Proposers ability to provide the Goods and Special Services. The Buyer may conduct such investigations as the Buyer deems necessary to assist in the evaluation of any Proposer and to establish the responsibility qualifications and financial ability of the Proposer to provide the Goods and Special Services in accordance with the Contract Documents to the Buyer's satisfaction within the prescribed time. The Buyer may request written clarification from the Proposer to clarify the Proposal. Subject to the statutory rights of the Proposer, the Buyer shall be the sole judge of responsiveness and reserves the right to reject the Proposal of any Proposer who does not pass any such evaluation to the sole satisfaction of the Buyer.

D. Proposers are advised that the capital cost (i.e., equipment) will be used in the evaluation of Proposals to determine the system cost.

E. In addition to the criteria outlined in Part 3 of Section 00 31 00, Proposal Evaluation, the Buyer will consider the following elements in evaluating Proposals:

1. The ability, capability and skill of the Proposer to perform the Contract or provide the service required; or

2. The character, integrity, reputation, judgment, experience and efficiency of the Proposer; or

3. Whether the Proposer can perform the Contract or provide the service promptly, and within the time specified without delay or interference; or

4. The performance quality of previous Contracts or services; or

5. Previous and existing compliance by the Proposer with laws relating to the Contract or service; or

6. The financial responsibility of the Proposer to perform the Contract or provide the service; or

7. The limitations of any license the Proposer may be required to possess; or

8. The quality, availability, and the adaptability of the product or service; or

9. The ability of the Proposer to provide future maintenance and service; or

10. Other information as may be pertinent and having a bearing on the decision to award the Contract; or

11. Compatibility and uniformity with existing equipment, services and procedures.

14.03 Intent to Award, Right to Protest

A. Upon completion of its evaluation, the Buyer will provide written Notice of Intent to Award to all Proposers.

B. Proposers may protest the Notice of Intent to Award. Only those who have protested the Notice of Intent to Award may protest a Notice of Award. All protests are subject to the Buyer's public Contracting rules.

14.04 Contract

A. Contract, if awarded, will be awarded to the best responsive and responsible Proposer, consistent with the Buyer's public Contracting rules and the request for Proposals, including these instructions for Proposers.

**ARTICLE 15 -- CONTRACT SECURITIES**

15.01 Article 4 of the Procurement General Conditions sets forth the Buyer's requirements as to Performance and other bonds and insurance. When the Successful Proposer delivers the executed Agreement to the Buyer, it must be accompanied by the required Performance and other Bonds.

**ARTICLE 16 -- EXECUTION OF AGREEMENT**

16.01 The successful Proposer shall sign and deliver the required number of copies of the agreement with attached documents to the Buyer within 15 days of receipt.

**ARTICLE 17 -- CONTRACT TO BE ASSIGNED**

17.01 Paragraph 11.2 of the agreement provides for the assignment of the Contract for furnishing Goods and Special Services covered by these Proposal Documents to a Contractor designated by the Buyer to construct the facilities and install the goods. Forms for documenting the assignment and for the agreement of the Seller's surety to such assignment are included as attachments to the agreement.

END OF SECTION

# SECTION 00 31 00 PROCUREMENT PROPOSAL EVALUATION

## PART 1 -- NOT USED

## PART 2 -- NOT USED

## PART 3 -- RFP EVALUATION CRITERIA

3.01 Responsive proposals will be evaluated in accordance with the requirements stated in this solicitation and any addenda issued. Evaluation of Proposals shall be accomplished by an evaluation team, which will determine the rankings of proposals. Each proposal will initially be evaluated only considering the contents of Envelope 1 for comparison of qualifications, experience, capabilities and capacity and scored accordingly. Once all proposals are evaluated and scored on the contents of Envelope 1, the evaluation team will then examine and score the contents of Envelope 2. The composite scores of Envelope 1 and Envelope 2 will be used as the basis for award to the highest combined scoring proposal.

3.02 In general, the information contained in Envelope No. 1 will be evaluated on: parent company qualifications, membrane system supplier qualifications, membrane fiber/module qualifications, and membrane system qualifications.

3.03 Envelope No. 2 will contain the membrane system capital cost information, the additive bid items and a detailed list of exemptions, exclusions, or assumptions not included from the technical specifications.

3.04 NOTE: Scoring within these categories is not limited to review of proposal information, but shall include, prior SOQs provided by each proposer, known operational facilities, references, and balance of plant evaluation.

The Buyer, at its sole discretion, may elect to select the top-scoring Proposers for an oral presentation.

The Buyer may contact any proposer for clarification of any portion of Proposer's proposal.

3.05 Evaluation Categories:

| | | |
|---|---|---|
| ENVELOPE 1 SCORING CRITERIA | | |
| PARENT COMPANY AND ORGANIZATION INFORMATION | = | 5 POINTS |
| MSS COMPANY AND ORGANIZATION INFORMATION | = | 15 POINTS |
| MEMBRANE FIBER AND MODULE INFORMATION | = | 20 POINTS |
| MEMBRANE SYSTEM INFORMATION | = | 30 POINTS |
| TOTAL FOR ENVELOPE 1 | = | 70 POINTS |
| ENVELOPE 2 SCORING CRITERIA | | |
| TOTAL CONTRACT PRICE (ITEM 4 IN SPECIFICATION 00 41 00) | = | 20 POINTS |
| DETAILED LIST OF EXCEPTIONS, EXCLUSIONS, OR ASSUMPTIONS | = | 10 POINTS |
| ADDITIVE BID ITEMS | = | 0 POINTS |
| TOTAL FOR ENVELOPE 2 | = | 30 POINTS |
| TOTAL FOR PROPOSAL (ENVELOPE 1 + ENVELOPE 2) | = | 100 POINTS |

3.06 PURCHASE ORDER AWARD CONDITIONS

A. The information contained in Envelope No. 1 will be evaluated and utilized to rank the Proposers in order of preference before opening Envelope No. 2. The evaluation team will consist of representatives of the Buyer. Buyer will then open Envelope No. 2 and assign points for capital cost, based on the following:

1. Lowest price to receive full 20 points

2. Mathematical difference between lowest price and another Proposer price is divided by the lowest price to arrive at a value that is then subtracted from 1.00. This resultant value will then be multiplied by the 20 points to determine the assigned points to other Proposers price.

B. If Buyer is able to reach agreement with preferred Proposer on scope, schedule, and pricing, then Buyer will move forward with the preferred Proposer.

C. If Buyer is unable to reach agreement with preferred Proposer on scope, schedule and pricing then Buyer will formally notify preferred Proposer of Buyer's intent to initiate discussions with second Proposer. If Buyer is able to reach agreement with second Proposer on scope, schedule, and pricing, then Buyer will move forward with second Proposer. If Buyer is unable to reach agreement with second Proposer on scope, schedule, and pricing, then Buyer may 1) reopen negotiations with one or both of the Proposers or 2) Buyer may discontinue RFP process and select neither Proposer.

END OF SECTION

# SECTION 00 40 00 PROPOSAL FORM

**PROPOSAL FOR:**
CITY OF SANDY, OREGON. ALDER CREEK UPGRADE PROJECT

## ARTICLE 1 – PROPOSAL RECIPIENT

1.01 THIS PROPOSAL IS SUBMITTED TO:

City of Sandy, OR
Attn: Jenny Coker, PE, Public Works Director.
Address: 39250 Pioneer Boulevard, Sandy, OR 97055
Phone: (503) 668-6927
Email: Jcoker@ci.sandy.or.us

## ARTICLE 2 – PROPOSER'S ACKNOWLEDGEMENTS

2.01 The undersigned Proposer proposes and agrees, if this Proposal is accepted, to enter into an Agreement with the Buyer, in the form included in the Proposal Documents, to furnish the Goods and Special Services as specified or indicated in the Proposal Documents for the prices and within the times indicated in this Proposal and in accordance with all other terms and conditions specified in the Proposal Documents.

2.02 Proposer accepts all of the terms and conditions of the Proposal Documents, including and without limitation, those dealing with the disposition of Proposal security. The Proposal will remain subject to acceptance for 90 days after the Proposal Closing Time, or for such longer period of time that Proposer may agree to in writing upon request of the Buyer.

2.03 Proposer accepts the provisions of the Agreement for liquidated damages in the event of its failure to furnish the Goods and Special Services in accordance with the schedule set forth in the Agreement.

2.04 Proposer accepts the provisions of the Agreement for assignment of the Contract for furnishing Goods and Special Services.

2.05 Proprietary Membrane System Proposers Acknowledgements

A. The Proposer acknowledges that it is the intent of the Proposal Documents to allow the Buyer to select a Proposer that will provide Goods and Special Services that conforms to the requirements of the Procurement Documents.

B. The Proposer acknowledges that they are a provider of membrane filtration equipment that incorporates proprietary design features. The Proposer recognizes that because of the inherent differences in the proprietary membrane equipment, the Proposal Documents include both equipment that is proprietary to the Proposer and requirements for equipment that is used in municipal membrane water treatment plants.

C. The Proposer acknowledges that during the development of the Proposal Documents, the Proposer has established design (i.e., capacity, membrane flux, redundancy), operational (i.e., energy, chemicals, chemical cleaning intervals,) and equipment requirements specific to the Proposer. The Proposer recognizes that the establishment of such design criteria is based upon the results of professional judgment and treatment of other similar water with site-specific considerations of the Buyer.

D. The Proposer acknowledges that it has reviewed the design criteria and that the Proposal offered will meet the design and operational criteria as described in the Proposal Documents. In submitting the Proposal, the Proposer agrees to provide Goods to meet or exceed the requirements required by the Proposal Documents.

E. The Proposer acknowledges that in accordance with Article 14 of Section 00 20 00, Instructions to Proposers, the Buyer has reserved its rights.

F. The Proposer acknowledges that the selection of a proprietary membrane equipment supplier (Proposer) is the sole decision of the Buyer and such decisions are final.

2.06 The Proposer accepts that the Contract Price offering for Special Engineering Services is fair and reasonable.

2.07 The Proposer accepts that the Buyer retains the right to issue a “Notice to Commence Fabrication” for the Membrane Filtration System. The Proposer acknowledges that until the “Notice to Commence Fabrication” is issued, the Buyer is not obligated to any monetary commitment associated with this Contract beyond that which is associated with Special Engineering Services and Pilot Testing.

A. A “Notice to Commence Fabrication” may be issued at any time for a period of 365 days after the Effective Date of the Agreement.

B. Upon the issuance of the “Notice to Commence Fabrication” the Contract Price for Membrane Units and Ancillary Equipment shall remain valid until 365 days after the Effective Date of the Agreement. If the Notice to Commence Fabrication is issued after 365 days of the Effective Date of the Agreement, the Contract Price will be adjusted through Change Order by the ratio of the Consumer Price Index (CPI) of the CPI of month that the Notice to Commence Fabrication is issued to the CPI of the month 365 days after the Effective Date of the Agreement.

2.08 The Proposer accepts that if the Proposer submits a Membrane Module Warranty Period in excess of 120-months, the Proposal shall be rejected as non-responsive with the requirements of the Proposal Documents.

2.09 Proposer acknowledges that their Proposal is being submitted to a public agency and that the Proposal will become public information as of the Proposal Closing Time. Additionally, the Proposer acknowledges that the Proposal and subsequent Proposal evaluation and recommendations to award a contract will become public information. In submitting this Proposal, the Proposer waives all rights pertaining to the confidentiality of documents whether or not specifically stated or implied. Exceptions will be a basis for declaring the Proposal non-responsive. If a Proposal contains any information that the Proposer believes is exempt from disclosure under the various grounds specified in the Oregon Public Records Law, the Proposer must clearly designate each such portion of its proposal as exempt at the time of proposal submission, along with a justification and citation to the legal authority relied upon. Identifying the Proposal, in whole, as exempt from disclosure is not acceptable. Failure to identify specific portions of the Proposal as exempt shall be deemed a waiver of any future claim of that information as exempt. The City will make available to any person requesting information, through the City processes for disclosure of public records, any and all information submitted as a result of this RFP not exempted from disclosure without obtaining permission from any Proposer to do so. City may also, in its sole discretion, elect to publish all such information at any time, regardless of whether or not a public records request has been received. However, if a public records request is made for material marked by the Proposer as exempt, the City will attempt to notify the impacted Proposer prior to any release of the material. Application of the Oregon Public Records Law by the City will determine whether any information is actually exempt from disclosure. The City accepts no liability for the release of any information submitted.

2.10 The Proposal shall be based upon design criteria, including maximum membrane flux established in the membrane procurement documents.

2.11 The Proposal Pricing shall include all applicable taxes and duties.

## ARTICLE 3 – PROPOSER'S REPRESENTATIONS

3.01 In submitting this Proposal, Proposer represents, as set forth in the Agreement, that:

A. Proposer has examined and carefully studied the Proposal Documents, the other related data identified in the Proposal Documents, and the following Addenda, receipt of which is hereby acknowledged.

| ADDENDUM NO. | ADDENDUM DATE |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

B. If specified, or if in Proposers judgment, any local condition may affect cost, progress or the furnishing of Goods and Special Services, Proposer has visited the Point of Destination and become familiar with and is satisfied as to the local conditions that may affect cost, progress, or the furnishing of Goods and Special Services.

C. Proposer is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of Goods and Special Services.

D. Proposer has carefully studied and correlated the information known to Proposer, and information and observations obtained from Proposers visits, if any, to the Point of Destination with the Proposal Documents.

E. Proposer has given Buyer written notice of all conflicts, errors, omissions, ambiguities, or discrepancies that Proposer has discovered in the Proposal Documents, and the written resolution thereof by Buyer is acceptable to Proposer.

F. The Proposal Documents are sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Proposal is submitted.

G. Proposer further represents that this Proposal is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Proposer has not directly or indirectly induced or solicited any other Proposer to submit a false or sham Proposal; Proposer has not solicited or induced any individual or entity to refrain from Proposal; and Proposer has not sought by collusion to obtain for itself any advantage over any other Proposer or over the Buyer.

**ARTICLE 4 – BASIS OF PROPOSAL**

4.01 Refer to Section 00 41 00, Proposal Pricing Form.

**ARTICLE 5 – TIME OF COMPLETION**

5.01 Proposer agrees that the furnishing of Goods and Special Services will conform to the schedule set forth in Article 5 of the Agreement.

**ARTICLE 6 – ATTACHMENTS TO THIS PROPOSAL**

6.01 Proposals must include submission of two sealed envelopes – Envelope No. 1 and Envelope No. 2 – as detailed below and must follow the additional requirements in Article 9 of Section 00 20 00, Instructions to Proposers to be considered responsive..

A. Sealed Envelope No. 1:

1. Required Proposer qualifications statement, accompanying information and supporting data, including:

   a. The completed Proposal Form (Section 00 40 00, Proposal Form)

   b. The completed Proposal Bond (Section 00 61 27, Proposal Bond)

   c. The evidence of the authority to sign.

   d. The draft pilot test plan, per Section 11 30 20, Performance Pilot Testing of Membrane Equipment.

2. The Seller (Membrane System Supplier or MSS) company and organization information

   a. Provide the following information on the Seller (MSS) portion of the parent company, and the parent company itself, as appropriate:

      1) Parent Company:

         a) A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year.

         b) Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.)

         c) The most recent independent audit report.

         d) Experience in the municipal water and wastewater treatment industry, both in the United States and internationally, and evidence of commitment to the municipal market.

e) Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company.

f) Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend.

2) Seller MSS Company:

a) A copy of the most recent annual report for the prospective proposer, including a certified financial statement for the most recent fiscal year.

b) Company background, including Organization Chart, number of employees (membrane specific, engineering, commissioning), and years in business under current name and ownership. Include same information for any affiliated companies integral to the timely manufacture, assembly, testing and delivery of the proposed membrane systems' major components (i.e. sub-assemblies, pumps, controls, etc.)

c) The most recent independent audit report.

d) Documented experience gaining approval for municipal installations through Oregon Health Authority

e) A description of the manufacturing facilities, their current and projected capacities; and their ability to meet delivery of 2 mgd systems in 2024-2025.

f) A minimum of three financial references with phone numbers; and, upon request of the City, each prospective proposer shall provide written authorization for such references to provide financial information to the City.

g) Dunn and Bradstreet reference number which can be used to access D&B records to independently determine the credit rating of the company.

h) Approximate current annual revenue from sales of technology for municipal water and wastewater treatment, and 5-year trend.

b. Membrane fiber and module information

1) Provide the following information on the membrane fiber and module proposed for use on this project:

a) Identified Membrane Element Manufacturer (MEM)

b) Documented experience of MEM treating surface water in western Washington and Oregon

c. Membrane system information

1) Provide the following information on the membrane filtration system proposed for use on this project:

a) A complete list of representative operational installations (with the product you have proposed for this project) within previous 10 years. Include the following information:

i. Plant Location

ii. Plant capacity

iii. Date of installation (equipment startup)

iv. Source water characteristics (i.e., secondary effluent, lake, reservoir, river, etc.). Clearly identify applications using coagulant addition for removal of phosphorus from municipal secondary effluent.

v. Type of pretreatment (coagulant, dose, type of pretreatment).

vi. Contact names, phone, e-mail. Proposer grants the City the right to contact any reference provided.

d. Identification and Qualifications of MSS's Project Manager and Resident Representative:

a) For the MSS's proposed project manager and resident representative (for Phase III – Post Operational Performance Test), provide name and resume listing applicable experience and references.

b) The MSS's project manager shall serve as the primary contact for the Buyer's project from receipt of Proposal through facility startup.

c) The MSS's project manager shall not be changed without the written consent of the Buyer and the Engineer.

d) Provide similar information for a designated secondary contact.

e. Proposed Performance Schedule: A detailed schedule meeting all of the requirements of Article 5 in Section 00 52 00, Procurement Agreement.

f. Project Delivery Plan:

1) A detailed plan for the delivery including the following elements at a minimum:

a) Engineering Services as described in Section 01 01 00, Summary of Goods and Special Services:

i. Identify engineering staff

ii. Level of effort

iii. Schedule

iv. Quality Assurance/Quality Control plan

v. Change Management Plan

vi. Communication Plan

b) Fabrication

i. Describe Proposer's plan to maintain and communicate schedule as it pertains to fabrication of the membrane system. What is Proposer's plan if fabrication schedule slips?

c) Installation Services

i. Describe Proposer's plan to meet the service requirements of Section 01 62 00, Installation of Membrane Equipment and Section 01 73 00, Installation, Operation and Maintenance Manuals.

d) Training

i. Describe Proposer's plan to meet the training requirements outlined in Section 01 73 10, Training of Operation and Maintenance Personnel.

e) Commissioning

i. Describe Proposer's plan to meet the commissioning requirements outlined in Section 01 66 00, Commissioning of Membrane Equipment.

f) One-Year onsite services as specified in 01 67 00, Acceptance Testing of Membrane Equipment.

i. Identify onsite and in office support staff

ii. Level of effort

iii. Quality Assurance/Quality Control plan

iv. Change Management Plan

v. Communication Plan

g. Verification of Performance Requirements

1) Performance Requirements:

a) Production Capacity: Confirm that the system will meet production capacity requirements for the range of feedwater quality stated in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

b) Membrane System Recovery: Verify conformance with the membrane system recovery requirements of Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

c) Membrane Filtered Water Quality: Confirm that system will meet requirements for membrane filtered water quality stated in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

d) Membrane Integrity Test System (MITS):

i. Describe monitoring parameters, instrumentation, and alarm thresholds for the online membrane integrity system.

ii. Describe verification, identification, and isolation procedures.

iii. Provide documentation describing the calculation of pathogen log removal values from the system based on the decay test results.

iv. State the time required to perform a MIT on each membrane train and the membrane system.

e) Pretreatment System Compatibility:

i. Provide certification that the proposed membrane system is compatible with the addition of chemicals to the feedwater as described in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

ii. Identify any limits to the concentration, contact time, or product thereof (e.g., ppm-hours) for any of the potential pretreatment chemicals listed in Section 11 30 00 Containerized Hollow Fiber Membrane Equipment Membrane Treatment System. If no adverse impacts are expected, so state.

h. Operations Descriptions:

a) Describe procedures for access, inspection, removal, repair, and replacement of membrane modules.

b) Describe startup and normal operation procedures, as well as methods for maintaining and recovering membrane system permeability (backwashing, maintenance cleans, CIPs, tank draining, etc., as applicable).

c) Shutdown/Storage/Startup:

i. Describe procedures for complete shutdown, storage of the membranes and related equipment, and startup.

ii. Detail process equipment necessary to accomplish storage of the plant.

iii. Detail chemical(s) required and estimated annual use for storage.

iv. Detail chemical(s) used for membrane delivery and storage on site during construction and recommendation for chemical(s) disposal.

v. Detail, if necessary, minimal membrane flow requirement to preserve membrane integrity during storage.

i. Statement of SCADA Software and Compatibility

a) Identify MSS's standard PLC applications software and SCS applications software.

b) Identify alternate SCS software systems, if any, utilized by MSS.

3. Letter from Proposer's surety company indicating Proposer is willing and able to provide the specified Payment and Performance Bonds.

4. Letter from Proposer's surety company indicating Proposer is willing and able to provide a separate bond to cover Warranty obligations through the Warranty period.

5. Letter from Proposer's insurance broker indicating Proposer is willing and able the specified Insurance.

6. Letter from an officer of Proposer's firm stating that Proposer takes no exceptions to the Form of Agreement.

7. A complete copy of the Proposal Documents, including Addenda. The front cover of each Volume of the Proposal Documents and Addenda shall be signed and dated by the individual designated in the Proposal Form. The documents shall be otherwise unaltered.

B. Sealed Envelope No. 2:

1. The completed Proposal Pricing Form (Section 00 41 00, Proposal Pricing Form)

2. Additive bid item for additional capacity; see Section 11 30 00, Containerized Hollow Fiber Membrane Equipment Membrane Treatment System.

3. Additive bid item for membrane container storage pricing.

a. If the Buyer is unable to accept and store the membrane containers, the Seller shall provide a service for storing the containers at a secure location. Buyer shall provide a price per month of storage, for up to 6 months.

**ARTICLE 7 – DEFINED TERMS**

7.01 The terms used in this Proposal have the meanings indicated in the Procurement General Conditions. The significance of terms with initial capital letters is described in the Procurement General Conditions.

**ARTICLE 8 – PROPOSAL SUBMITTAL**

8.01 Respectfully submitted on (date) _____

This Proposal is submitted by:

## Corporation

(Corporation Name)

(State of Incorporation)

(Signature of Officer Authorized to Sign)

(Printed or Typed Name and Title of Officer Authorized to Sign)

(CORPORATE SEAL)

(Signature of Attesting Party)

(Printed or Typed Name Attesting Party)

(Corporation Business Address)

(Phone No.)

Person to whom notices and correspondences regarding this Proposal should be addressed to:

(Corporation Business Address)

(Phone No.)

END OF SECTION

**SECTION 00 41 00**

**PROPOSAL PRICING FORM**

PROJECT TITLE: Alder Creek Water Treatment Plant Upgrade (Project)

THIS BID IS SUBMITTED TO:

City of Sandy (as Buyer):
39250 Pioneer Boulevard
Sandy, OR 97055
Attn: Jenny Coker
(505) 668-6927
Jcoker@ci.sandy.or.us

The undersigned Seller having carefully examined the drawings, specifications, and all addenda thereto, and other Procurement Documents for furnishing Goods and Special Services for Project, and become familiar with all local conditions including labor affecting the cost thereof, does hereby propose to furnish all labor, mechanics, superintendence, tools, materials, equipment and all utilities, fuel, transportation, applicable taxes and duties, and services necessary to perform and complete said work, and work incidental thereto, in a workmanlike manner, as described in the Procurement Documents, in accordance with the bid prices hereinafter set forth.

Note: Unit and lump sum prices must be shown in words and figures in the proposal for each item being bid and in the event of discrepancy, the words shall control.

**Envelope 2 - Procurement of Membrane Filtration Equipment and Special Services**: Capital costs for complete Membrane System as specified in the procurement documents and drawings for the Project.

**CONTRACT PRICES FOR PROCUREMENT OF MEMBRANE FILTRATION EQUIPMENT AND SPECIAL SERVICES**

**Item 1: Price for Performance Pilot Test**

The Contract Price for the Pilot Study has been determined by the Buyer as fair and reasonable.

**Seventy-Five Thousand Dollars and no cents**
**($ 75,000.00)**

**Item 2: Price for Special Engineering Services**

The Contract Price for Special Engineering Services has been determined by the Buyer as fair and reasonable.

**One Hundred and Twenty-Five Thousand Dollars and no cents**
**($ 125,000.00)**

**Item 3: Contract Price for Containerized Membrane Filtration Systems including Ancillary Equipment**

_____ dollars

($ _____)

**Item 4: Total Contract Price**
*Add Items 1, 2, and 3.*

_____ dollars

($ _____)

**Item 5: Membrane Module Price***

Indicate the Membrane Module Price in current dollars as of the Proposal Opening Time.

_____ dollars

($ _____)

**Item 6: Indicate the Proposer's maximum instantaneous membrane flux (see notes)**

_____ Gallons/ ft2-day **(words)**

_____ Gallons/ ft2-day **(number)**

Notes:
1). Maximum membrane flux shall be calculated using the feed side of the membrane proposed by the Proposer as an instantaneous value. Any proposal with maximum membrane flux exceeding 60.0 gallons/ ft2-day will be rejected by the Buyer.

2). Maximum membrane flux does not include the contractual requirements for redundancy and reliability.

**Item 7: Indicate the number of membrane modules per membrane unit proposed**

_____ **(words)**

_____ **(number)**

**Item 8: Membrane Module Warranty Period***

Per Paragraphs 2.08 and 2.09 of the Proposal Form, indicate the Membrane Module Warranty Period (Full and Pro-Rata Replacement) in months.

120 months

**Item 7: Membrane Module Pricing Mechanism***

Per Paragraph 2.08 of the Proposal Form, the Proposer shall indicate if membrane module pricing is fixed or variable with the CPI. Proposer shall indicate the method by writing the words “fixed membrane module price” or “variable with CPI membrane module price” in the space below.

**Item 8: Container Monthly Storage Price – Additive Bid item**

Per Paragraph 6.01 of the Proposal Form, the Proposer shall indicate pricing for monthly storage of membrane containers.

**dollars/month**

**($ )**

**Item 9: Additional Capacity – Additive Bid item**

Per Paragraph 6.01 of the Proposal Form and Section 11 30 00, Containerized Hollow Fiber Membrane Equipment Membrane Treatment System, the Proposer shall indicate pricing for additional capacity.

**dollars**

**($ )**

**PERFORMANCE, PAYMENT, AND MAINTENANCE BOND**

The Undersigned agrees, if awarded the Procurement Agreement, to furnish bonds as required by the Procurement Documents for the faithful performance of the furnishing of Goods and Special Services under the Procurement Agreement.

**PROPOSAL SECURITY**

Proposal security consisting of certified check, cashier's check, or bid bond (Section 00 61 27, Proposal Bond) and made payable to Buyer, in the amount of $_____, which represents five (5) percent of the Total Amount Bid, is enclosed herewith.

The proposal security accompanying this proposal shall be returned to the Seller unless, in case of the Buyer's acceptance of the Proposal, the Seller fails to execute the Procurement Agreement and submit performance and payment bonds within 15 days after its acceptance. In such a case, the Proposal Security shall become the property of the Buyer and shall be considered as payment for damages due to delay and other inconveniences suffered by the Buyer on account of such failure of the Seller. It is understood that the Buyer reserves the right to reject any and all proposals.

**RESPECTFULLY SUBMITTED ON (DATE)** _____
This Proposal is submitted by:

**Corporation**

_____
(Corporation Name)

_____
(State of Incorporation)

_____
(Signature of Officer Authorized to Sign)

_____
(Printed or Typed Name and Title of Officer Authorized to Sign)

_____
(CORPORATE SEAL)

_____
(Signature of Attesting Party)

_____
(Printed or Typed Name of Attesting Party)

_____
(Corporation Business Address)

_____
(Phone No.)

_____
(Person to Whom Notices and Correspondence Regarding This Proposal Should Be Addressed)

_____
(Corporation Business Address)

_____
(Phone No. and Email Address)

**END OF SECTION**

# SECTION 00 52 00 PROCUREMENT AGREEMENT

This agreement is between the City of Sandy ("Buyer") and
_____ ("Seller").

## ARTICLE 1 – RECITALS

1.01 The Project for which the Goods and Special Services are to be provided under the Contract Documents is generally described as follows: City of Sandy Alder Creek Water Treatment Plant Upgrade Project that will include an on-site proof of performance pilot test and furnishing a complete set of two (2) hollow fiber membrane containers each with a firm capacity of 2.0 mgd.

1.02 The Seller manufactures membrane filtration systems used in water treatment plants.

1.03 Seller shall furnish the Goods and Services as specified or indicated in the Contract Documents.

## ARTICLE 2 -- GOODS AND SPECIAL SERVICES

2.01 The Seller shall provide and operate a membrane filtration pilot system on the buyer's Alder Creek water treatment plant site to validate the Seller's membrane filtration media and system, design parameters, and operating guarantees. If the Buyer determines that the pilot test is successful, the Buyer will provide the Seller with written notice. The Buyer reserves the right to evaluate the Seller's performance during the pilot study and use that as a basis for evaluating successful completion.

2.02 The Buyer will execute the Agreement, subject to Seller's exceptions herein, and administer the Contract for Special Engineering Services associated with the preparation of Shop Drawings and other Submittals required for the project.

2.03 The Buyer is not obligated under this Agreement beyond Special Engineering Services and pilot testing until it issues a "Notice to Commence Fabrication" to the Seller. A Notice to Commence Fabrication may be issued at any time for a period of 365 days after the effective date of the Agreement.

2.04 Upon "Notice to Commence Fabrication" from the Buyer to the Seller, the Seller shall then:

A. Fabricate and deliver membrane filtration equipment and ancillary components (the "Goods") to the Facility,

B. Assist during installation and commission the Goods,

C. Deliver operational and maintenance manuals,

D. Provide operations assistance for one year after installation of the Goods, and

E. Warranty the membrane modules and system per the Contract Documents.

2.05 The Buyer retains the right to assign the remaining portion of the work, which includes the production, delivery and commissioning of the goods and all associated Special Services, to a Contractor.

2.06 The Seller shall deliver the required Bonds and insurance certificates in accordance with Article 4 of the General Conditions.

A. At the time of the effective date of the Agreement, a Performance Bond shall be provided for the Special Engineering Services for the full amount stated in Proposal.

B. Another Performance Bond and the Payment Bond shall be provided upon issuance of the "Notice to Commence Fabrication" in the full amount of the stated amount in Proposal.

2.07 The Buyer retains the right to terminate this Agreement after the pilot test and contract with another entity to provide membrane filtration equipment for the Facility.

**ARTICLE 3 – ENGINEER**

3.01 The Contract Documents were prepared by Stantec Consulting Services Inc., 601 SW 2nd Ave, Suite 1400, Portland, OR 97204, Attn: Adam Odell, PE, Adam.Odell@stantec.com, 503.220.5409, hereinafter called "Engineer" and who is to assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents.

**ARTICLE 4 – POINT OF DESTINATION**

4.01 The Goods shall be delivered to the point of destination: The Alder Creek Water Treatment Plant, which contains no known address, but is accessible from a private gravel road in between Whiskey Creek Rd. and E. Terra Fern Drive 7 miles east of Sandy, OR.

**ARTICLE 5 – CONTRACT TIMES**

5.01 TIME IS OF THE ESSENCE

A. All time limits for Milestones for the delivery of Goods and the furnishing of services as stated in the Contract Documents are of the essence of the Contract.

5.02 DAYS TO ACHIEVE THE PROOF OF PERFORMANCE PILOT TEST

A. The dates for the pilot study are set forth in the following table:

| Item No. | Pilot Study Contract Time | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|---|
| | **Pilot Study** | | |
| A | Draft Work Plan | With Proposal | |
| B | Final Work Plan | Receipt of Engineer's Comments | 7 |
| C | Deliver pilot equipment | Effective Date of Agreement | 14 |
| D | Have Pilot Plant Operational at site | Effective Date of Agreement | 28 |

| | | | |
|---|---|---|---|
| D | Complete pilot study program | Effective Date of Agreement | 118 |
| E | Submit Draft Pilot Summary Report | Effective Date of Agreement | 118 |
| F | Submit Final Pilot Summary Report | Receipt of Engineer's Comments | 14 |

## 5.03 DAYS TO ACHIEVE SUBMITTAL OF SHOP DRAWINGS AND SAMPLES

A. All Shop Drawings and Samples required by the Contract Documents will be submitted to the Buyer for Engineer's review and approval in accordance with the following schedule.

**Special Engineering Services**

| Item | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. First Shop Drawing Submittal | Effective Date of Agreement | 45 |
| 2. First Shop Drawing Approval | Effective Date of Agreement | 90 |
| 3. Second Shop Drawing Submittal | Effective Date of Agreement | 75 |
| 4. Second Shop Drawing Approval | Effective Date of Agreement | 120 |

## 5.04 DAYS TO ACHIEVE DELIVERY OF GOODS

A. The Goods are to be complete and ready for the Buyer's receipt of delivery at the Facility in accordance with the following schedule:

**Goods**

| Item | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. Goods, excluding Computer Equipment, Membrane Modules, and Spare Parts | Notice to Commence Fabrication | 240 |
| 2. Computer Equipment | Notice of Completed Installation | 10 |
| 3. Membrane Modules | Notice of Completed Installation | 14 |
| 4. Spare Parts | Notice of Completed Installation | 30 |

1. The Seller shall not start to manufacture any Goods until the Shop Drawings have been approved and the Buyer has issued a "Notice to Commence Fabrication." The Goods, excluding the membrane modules, are to be fabricated and ready for delivery prior to 315 240 days after the "Notice to Commence Fabrication" is issued.

2. The Seller shall hold the spare parts, membrane modules and computer equipment and deliver to the Facility for installation during commissioning. The spare parts, computer equipment and membrane modules will be delivered in a timely manner as not to impede or delay the commissioning.

## 5.05 PROJECT MILESTONES FOR SPECIAL SERVICES AND SELLER'S WARRANTEE AND GUARANTEE

A. The furnishing of Special Services to the Buyer will commence upon the execution of the Agreement between the Buyer and the Seller. The Seller shall deliver all Special Services required by the Contract Documents based upon the following milestones.

1. Special Engineering Services

a. Upon execution of the Agreement, the Seller will begin to provide Special Engineering Services required for Shop Drawings and Samples.

2. Special Services

   a. Upon the issue of a Notice to Commence Fabrication, the following Contract Times will commence.

**Special Services**

| Contract Time | Notice to Begin Contract Times | Calendar Time (Days) |
|---|---|---|
| 1. Installation Manuals | Notice to Commence Fabrication | 150 |
| 2. Commissioning | Notice of Completed Installation | 30 |
| 3. Operator Training | Notice of Completed Commissioning | 15 |
| 4. Preliminary O&M Manual | Notice of Completed Installation | 15 |
| 5. Acceptance Testing | Notice of Completed Operator Training | 45 |
| 6. Final O&M Manual | Notice of Substantial Completion | 45 |
| 7. Warranty Period | Notice of Substantial Completion | 365 |

   b. Operational and Maintenance Manuals shall be delivered at the times indicated in Section 01 73 00, Installation, Operations and Maintenance Manuals.

   c. In accordance with Section 01 62 00, Installation of Membrane Equipment, Special Services associated with the Installation of the Goods, shall commence with the delivery of the Goods and shall be completed when the “Notice of Completed Installation” is issued by the Engineer.

   d. In accordance with Section 01 66 00, Commissioning of Membrane Equipment, commissioning shall commence after the “Notice of Completed Installation” is issued and associated work has been completed. Upon completion of commissioning, a “Notice of Completed Commissioning” will be issued by the Engineer.

   e. In accordance with Section 01 73 10, Training of Operations and Maintenance Personnel, Operator Training shall commence after the “Notice of Completed Commissioning.” Upon completion of Operator Training, a “Notice of Training Completion” will be issued by the Engineer.

   f. In accordance with Section 01 67 00, Acceptance Testing of Membrane Equipment, acceptance testing shall not commence until after the prerequisite “Notice of Training Completion” is issued. Upon completion of Acceptance Testing, the “Notice of Substantial Completion” will be issued by the Engineer.

   g. In accordance with Section 01 68 00, Operations Assistance, operations assistance shall be provided in accordance with the requirements of that Section. The Correction Period shall commence on the date when the “Notice of Substantial Completion” is issued.

B. For the purposes of Seller’s warranty and guarantee, the following Project milestones are as follows:

   1. In accordance with Section 01 74 00, Membrane System and Module Warranty, the Membrane Module Warranty Period shall commence on the date when the Acceptance Testing first begins.

2. The Correction Period shall commence on the date the “Notice of Substantial Completion” is issued.

5.06 LIQUIDATED DAMAGES

A. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if the Special Engineering Services are not delivered to the Buyer within the times specified in Paragraph 5.02, above. They also recognize that the timely performance of services by other parties involved in the Buyer’s Project are materially dependent upon the Seller’s specific compliance with the requirements of Paragraph 5.02 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable submittals are not delivered on time. Accordingly, and instead of requiring proof of such losses or damages, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty), the Seller shall pay the Buyer $2,500.00 for each day that expires after the times or dates specified in Paragraph 5.02 for deliveries of acceptable submittals. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

B. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if 1) the Goods, associated with the Membrane Filtration System are not fabricated and ready for delivery to the Buyer within the time specified in Paragraph 5.03 above, or 2) if the membrane modules are not delivered in a timely manner as stated in Paragraph 5.03 above. They also recognize that the timely performance by other parties involved in the Buyer’s Project are materially dependent upon the Seller’s specific compliance with the requirements of Paragraph 5.03 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable Goods or membrane modules are not delivered on time. Accordingly, and instead of requiring proof of such losses or damages, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty) the Seller shall pay Buyer $2,500.00 for each day that expires after the times or dates specified in Paragraph 5.03 for delays involving delivery of the Goods. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

C. The Buyer and the Seller recognize that time is of the essence of this Agreement and that the Buyer will suffer damages if the Special Services are not delivered in a timely manner as stated in Paragraph 5.04, above. They also recognize that the timely performance by other parties involved in the Buyer's Project are materially dependent upon the Seller's specific compliance with the requirements of Paragraph 5.04 plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. Further, they recognize the delays, expense, and difficulties involved in proving the actual losses or damages suffered by the Buyer if complete acceptable Goods, membrane modules or Special Services are not delivered on time. Accordingly, the Buyer and the Seller agree that as liquidated damages for delay (but not as a penalty) the Seller shall pay Buyer $1,000.00 for each day that expires after the times or dates specified in Paragraph 5.04 for delays involving delivery of the Special Services. By execution of this Agreement, the Buyer and the Seller expressly agree that these liquidated damage amounts are reasonable under the circumstances existing at the time this Agreement is executed.

D. The Buyer may deduct the amount of liquidated damages from monies due the Seller under this Agreement. Liquidated damages shall not exceed five (5) percent of the contract price.

E. The liquidated damages provided in this Section shall be Buyer's sole and exclusive remedy for Seller's late delivery of Special Engineering Services, Goods, and Special Services.

F. If Seller is prevented from achieving the delivery times, milestone submittal dates or response times as defined in Articles 5.02A.5, 5.03D, and 5.03E, for any reason beyond Seller's reasonable control and not attributable to its actions or inactions, Seller shall not be assessed liquidated damages and shall be entitled to an adjustment of the Contract Times in an amount equal to the duration of the reason or event causing the delay in delivery.

G. Upon receipt of Buyer's Notice to Commence Fabrication of Equipment that satisfies Seller's requirements for meeting the delivery schedule, Seller shall commence fabrication of equipment. The place of delivery specified therein shall be firm and fixed, provided that Buyer may notify Seller no later than 45 days prior to the scheduled shipment date of the products of an alternate point of delivery (the "Alternate Delivery Site"). Provided the parties agree to a variation to take into account any additional cost [or delay] incurred by Seller in implementing this change, the Alternate Delivery Site shall become the agreed place of delivery for all purposes under this Agreement. In such event the following conditions shall apply: (i) title and risk of loss shall pass to the Buyer upon delivery of the products to the Alternate Delivery Site; (ii) any amounts payable to the Seller upon delivery or shipment shall become payable upon delivery of the products to the Alternate Delivery Site; (iii) any additional expenses incurred by the Seller in connection with such shipment to storage shall become payable by the Buyer upon submission of the Seller's invoice(s) (including but not limited to costs of any additional transportation, preparation for and placement into storage, handling, inspection, preservation, insurance, storage, removal charges and any applicable taxes); (iv) transportation of the products from the storage facility to their place of installation shall be the Buyer's responsibility; and, (v) if the Contract includes Services, subject to the terms and conditions in the Contract the Seller shall resume provision of Services to Buyer when instructed to do so by Buyer provided that all amounts due hereunder plus any cost incurred by Seller in delaying such Services have been paid.

5.07 LIQUIDATED DAMAGES FOR PILOT STUDY

A. During the Pilot Study, should the results indicate system performance capabilities that are less than those defined in Sections 11 30 00, Hollow Fiber Membrane Equipment, the Seller shall modify its equipment to meet the minimum defined system performance capabilities, repeat the entire duration of the Pilot Study, and pay for liquidated damages to account for the loss suffered by the Buyer due to schedule delay. Liquidated damages shall be assessed at $500 per day starting at the determination of Pilot Study initial attempt failure until the commencement of the Pilot Study second attempt up to a maximum amount of $5,000. Should the second attempt of Pilot Study yield system performance results that are less than those defined herein, the Seller will be deemed non-responsive and the Buyer may begin to negotiate with the next lowest responsive Proposer.

B. The liquidated damages provided in this Section shall be Buyer's sole and exclusive remedy for Seller's failure to meet the Pilot Study requirements of this Agreement.

C. Liquidated damages shall be assessed per day of delay and in the event that there are multiple items where the Contract Times has been exceeded Liquidated Damages shall not be combined.

**ARTICLE 6 – CONTRACT PRICE**

6.01 The Buyer shall pay Seller for furnishing the Goods and Special Services in accordance with the Contract Documents in current funds as follows:

A. The prices stated in Seller's Proposal, attached hereto as an exhibit.

B. Seller shall pay all applicable taxes and duties.

C. The Contract Price for membrane units and ancillary equipment shall remain valid for 180 days after the effective date of the agreement. If the “Notice to Commence Fabrication” is issued after 180 days from the effective date of the agreement (up to a maximum of 3 years), the Contract Price will be adjusted through Change Order. Contract Price adjustment will be the ratio of the Producers Price Index (PPI) of the PPI of month that the “Notice to Commence Fabrication” is issued, to the PPI of 180 days after the effective date of the agreement.

D. Membrane modules shall be made available for purchase by the Buyer at the pricing offered in the Proposal Pricing Form and that the pricing for future membrane modules, as part of a warranty claim or replacement purchase, shall be in accordance with the methods described in 01 74 00, Membrane System and Module Warranty. Membrane Module Pricing shall remain effective for a period of 20 years after the proposal date.

E. In the event that the City (or Contractor if the Contract is assigned) does not issue the “Notice of Completed Installation” within 500 days after the “Notice to Commence Fabrication”, 40 percent of the Contract Price shall be adjusted through Change Order by the ratio of the PPI of the month the “Notice of Completed Installation” to the month of 500 days after the “Notice to Commence Fabrication”.

1. This Change Order mechanism is provided in the event that there is an unforeseen delay during construction. The above provision is provided as the sole compensation to the Seller for the delay in the delivery of membrane modules and applicable Special Services described in Paragraph 5.03.A of the Agreement.

2. The applicable provisions of Paragraph 5.03.A remain contractual obligations of the Seller.

F. By issuance of a Change Order, all Alternate Proposal pricing in the Proposal Form shall remain open and subject to acceptance by the Buyer for a period of 2 years after the proposal date.

**ARTICLE 7 – PAYMENT PROCEDURES**

7.01 SUBMITTAL AND PROCESSING OF PAYMENTS

A. Seller shall submit Applications for Payment in accordance with Article 13 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

7.02 PROGRESS PAYMENTS

A. Buyer shall make progress payments on account of the Contract Price on the basis of Seller’s Applications for Payment as follows:

1. Progress Payments for Special Engineering Services:

a. The Buyer shall pay Seventy-Five Thousand Dollars ($75,000.00) for Pilot Testing Services provided as part Paragraph 10.01.A.1.a.1 of the General Conditions, to the Seller upon the Buyer's approval of the first Application for Payment for Pilot Testing Services, submitted in accordance with Paragraph 10.01.A.1 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 10.2.A of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

b. The Buyer shall pay One Hundred and Twenty Five Thousand Dollars ($125,000.00) for Special Engineering Services provided as part, Paragraph 10.01.A.1.a.2 of the General Conditions to the Seller upon the Buyer's approval of the Application for Payment for Special Engineering Services, submitted in accordance with Paragraph 10.01.A.1 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 10.02.A of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

2. Progress Payments for Goods and Special Services.

a. The Buyer shall make progress payments on the Total Contract Price for Goods and Special Services in accordance with Article 10 of the General Conditions and based upon the following schedule:

**Payment Schedule**

| Payment | Contract Milestone(s) | Percentage of Total Contract Price |
|---|---|---|
| First Application | Notice to Commence Fabrication | 75 |
| Second Application | Delivery of Goods | 90 |
| Final Application | Notice of Substantial Completion | 100 |

b. The Buyer shall pay the above percentages of the Total Contract Price provided as part Paragraph 13.01 of the General Conditions to the Seller upon the Buyer's approval of the Application for Payment, submitted in accordance with Paragraph 13.01 of the General Conditions, and accompanied by the Engineer's recommendation for payment in accordance with Paragraph 13.02 of the General Conditions less such amounts as Engineer may determine in accordance with Paragraph 13.02 of the General Conditions.

c. The Total Contract Price is the Total Contract Price as indicated in the Proposal Pricing Form as adjusted through change order less liquidated damages assessed as part of the Contract.

7.03 FINAL PAYMENT

A. Upon the Buyer's approval of the final Application for Payment, accompanied by the Engineer's recommendation for payment in accordance with Article 13 of the General Conditions, the Buyer shall make the final payment to bring the total payment to 100 percent of the Contract Price as adjusted for changes to the Contract Price or less any prior payments to the Seller. This payment, at the Engineer's recommendation, may be less such amounts, as Engineer shall determine in accordance with the Agreement or any applicable provisions of the General Conditions.

B. The Final Payment shall be accompanied by a "Notice of Contract Completion" executed by both parties.

**ARTICLE 8 -- INTEREST**

8.01 Subject to the provisions of Article 13 of the General Conditions, all monies not paid within 60 days after the receipt of the Seller's Application for payment shall accrue interest at the rate of the 6 percent per annum.

**ARTICLE 9 - SELLER'S REPRESENTATIONS**

9.01 In order to induce Buyer to enter into this Agreement, Seller makes the following representations:

A. Seller has examined and carefully studied the Contract Documents and the other related data identified in the Proposal Documents.

B. If specified or if, in Seller's judgment, any local condition may affect cost, progress or the furnishing of the Goods and Special Services, Seller has visited the Facility location and become familiar with and is satisfied as to the local conditions that may affect cost, progress or the furnishing of the Goods and Special Services.

C. Seller is familiar with and is satisfied as to all local federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of the Goods and Special Services.

D. Seller has carefully studied and correlated the information known to Seller, and information and observations obtained from Seller's visits, if any, to the Point of Destination, with the Contract Documents.

E. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Seller.

F. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Special Services.

G. The Seller has provided test data from either full-scale operation(s) or pilot test data from facilities of similar water quality to the Project as information and design concepts for its proprietary membrane system. In providing the information and design concepts for this Project, the Seller has considered and incorporated the concept of “linear scalability” into its design. Linear scalability means that: 1) the Seller has considered and evaluated the design and operational requirements and results of pilot or demonstration testing, and 2) that the equipment provided by the Seller is warranted to produce water in proportion to the design and operational parameters established and demonstrated during pilot testing.

H. The concept of linear scalability relates to the surface area of the membrane and to its corresponding ability to produce water as a dependent variable on an incremental and proportional basis. Dependent variables are the parameters of specific or instantaneous design (e.g., membrane flux, process flows, temperatures, times, maximum pressures, and chemical dosages or consumption) requirements for filtration, backwashing, cleaning, and integrity testing processes that are established on a module basis during piloting and/or incorporated into the unit and system design provided by the Seller to meet the design capacity requirements established in the Contract Documents.

I. The concept of linear scalability excludes the independent variables that involve membrane removal performance and overall system performance established in the Contract Documents. Such independent variables include the water quality removal requirements, removal efficiency, and the minimum design requirements for Maintenance/Recovery Clean interval when the membrane system is operated within its intended process design range.

J. Seller’s relationship to the Buyer in performance of this Agreement is that of an Independent Contractor. The personnel performing services under this Agreement shall at all times be under the Seller’s exclusive direction and control and not employees of the Buyer. Seller shall pay all wages, salaries and other amounts due to its employees in connection with this agreement and shall be responsible for all applicable state, federal, and local reports and obligations respecting them such as labor wages, social security, income tax withholding, unemployment compensation and similar matters.

## ARTICLE 10 – CONTRACT DOCUMENTS

10.01 CONTENTS

A. The Contract Documents consist of the following:

1. Procurement Agreement

2. Exhibits to this Agreement (enumerated as follows):

a. Exhibit A-1 to Agreement between Buyer and Seller dated _____, Assignment of Contract; Consent to Assignment; and Acceptance of Assignment.

b. Exhibit A-2 to Agreement between Buyer and Seller dated _____ Agreement to Assignment by Seller's Surety.

c. Seller's completed Proposal Form and Proposal Pricing Form.

d. Documentation submitted by Seller prior to Notice of Award

3. Performance Bond

4. Payment Bond

5. Section 00 80 50 Supplementary Conditions to EJCD Procurement General Conditions, P-200 (2000 Edition)

6. Conceptual Design Report – Alder Creek Water Treatment Plant Upgrade Project

7. Addenda (Numbers _____to _____, inclusive)

8. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

a. Notice to Commence Fabrication

b. Notice of Completed Installation

c. Notice of Completed Commissioning

d. Notice of Training Completion

e. Notice of Substantial Completion

f. Final Acceptance

g. Written Amendment(s)

h. Change Order(s)

i. Field Order(s)

j. Engineer's Written Interpretation(s).

B. The documents listed in Paragraph 10.01 A. are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 10.

D. The Contract Documents may only be amended or supplemented as provided in Paragraph 3.04 of the General Conditions.

E. In resolving inconsistencies or ambiguities between two or more components of the Contract Documents, the highest precedence shall be given to the Agreement and the order of precedence shall decrease in the following manner:

1. Agreement
2. Addenda
3. Section 00 80 50 Supplementary Conditions to EJCD Procurement General Conditions, P-200 (2000 Edition)
4. Specification Section 01 74 00, Membrane System and Module Warranty
5. Exhibits to the Agreement
6. Performance Bond
7. Payment Bond.
8. Certificates of Insurance
9. Final Acceptance(s)
10. Change Order(s)
11. Engineer's Written Interpretation(s)
12. Field Order(s)
13. Notice(s) of Substantial Completion
14. Notice(s) of Training Completion
15. Notice(s) of Completed Commissioning
16. Notice(s) of Completed Installation
17. Notice(s) to Commence Fabrication
18. Project Specifications shall be used to govern the quality of the Goods.
19. Submittals provided by the Seller in fulfillment of the Contract.

F. In the event of a conflict between a schedule or a schedule update and a specific requirement of these Contract Documents, the Contract Documents shall, at all times, have precedence. Submittal or acceptance of a schedule or schedule update shall not supersede the requirements of the Contract Documents.

**ARTICLE 11 – MISCELLANEOUS**

11.01 DEFINED TERMS

A. Terms used in this Agreement will have the meanings indicated in the General Conditions and the Supplementary Conditions.

11.02 ASSIGNMENT

A. Buyer has the right to assign the Contract for furnishing Goods and Special Services hereunder and Seller shall accept such assignment. Forms documenting the assignment of the Contract, and consent of Seller's surety to the assignment are attached as exhibits to this Agreement.

1. The Contract will be executed in the name of Buyer initially and may be assigned to a Construction Contractor designated by Buyer. The assignment will occur on the effective date of the agreement between Buyer and the Construction Contractor. As of the date of acceptance of assignment by the Construction Contractor, all references in the Contract Documents to Buyer shall mean the designated Construction Contractor whose responsibilities will include the installation and erection of the Goods.

2. The assignment of the Contract shall relieve Buyer from all further obligations and liabilities under the Contract. After assignment, Seller shall become a subcontractor or Seller to the assignee and, except as noted herein, all rights, duties, and obligations of Buyer under the Contract shall become the rights, duties and obligations of the assignee.

3. After assignment:

a. All performance warranties and guarantees required by the Contract Documents will continue to run for the benefit of Buyer and, in addition, for the benefit of the assignee.

1) Seller shall submit Applications for Payment to the Contractor who shall forward the Application for Payment to the Engineer.

2) Buyer will provide payment directly to the Seller.

b. Except as provided in this Paragraph 11.02.A.3.b., all rights, duties and obligations of Engineer to assignee and Seller under this Contract will cease.

1) Engineer will review Seller's Applications for Payment and make recommendations to assignee for payments as provided in Paragraphs 10.02 and 10.06 of the General Conditions.

2) Upon the written request of either the assignee or Seller, Engineer will issue with reasonable promptness such clarifications or interpretations of the Contract Documents, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications and interpretations will be final and binding on assignee and Seller unless:

a) an appeal from Engineer's clarification or interpretation is made within the time limits and in accordance with the dispute resolution procedures set forth in Article 13 of the General Conditions; or

b) if no such dispute resolution procedures have been set forth, a written notice of intention to appeal is delivered by assignee or Seller to the other within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision (unless otherwise agreed to in writing by assignee and Seller), to exercise such rights or remedies as the appealing party may have with respect to such clarification or interpretation in accordance with applicable Laws and Regulations.

3) When rendering a clarification or interpretation under Paragraph 11.02.A.3.b.2), Engineer will not show partiality to assignee or Seller and will not be liable in connection with any clarification or interpretation rendered in good faith.

c. Upon assignment, Seller shall provide Construction Contractor with revised insurance certificates listing both Construction Contractor and Buyer as additional insureds.

B. No other assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound. Specifically, but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law). Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

11.03 SUCCESSORS AND ASSIGNS

A. Buyer and Seller each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

11.04 CHOICE OF LAW AND VENUE

A. The laws of the State of Oregon shall govern the formation, interpretation, and performance of this Agreement. Venue for mediation and/or actions arising out of this Agreement shall be in Clackamas County, Oregon.

11.05 ENTIRE AGREEMENT

A. This Agreement that includes the Contract Documents contains the entire agreement, between the parties and supersedes all prior negotiations, discussions, obligations, and rights of the parties regarding the subject matter of this Agreement. There is no other written or oral understanding between the parties. No modification, amendment or alteration of this Agreement shall be valid unless it is in writing and signed by the parties hereto.

11.06 COUNTERPARTS

A. This Agreement may be executed in counterparts, which when taken together shall constitute a single signed original as though all parties had executed the same page.

11.07 AUTHORITY TO EXECUTE AGREEMENT

A. Each person signing on behalf of a corporation, partnership, joint venture or governmental entity hereby declares that he or she, or it has the authority to sign on behalf of his or her or its respective corporation, partnership, joint venture, entity and agrees to hold the other party or parties hereto harmless if he or she or it does not have such authority.

11.08 SELLERS TOTAL LIMITATION OF LIABILITY

A. Notwithstanding any other provisions of the Contract Documents, the Seller's total liability for direct damages arising at any time under any of the Contract Documents or otherwise in connection with completing the Contract (whether arising under breach of contract, tort, strict liability, or any other theory of law) shall not exceed the amount of the Contract Price. In no event shall either party be liable for any indirect, penalty, incidental, special, or consequential damages. Seller's aggregate liability under the Contract (whether arising under breach of contract, tort, strict liability, or any other theory of law) shall not exceed the amount of the Contract Price.

BUYER: City of Sandy, Oregon

By: _____

Title _____

Executed on _____/_____, 20____ (month/day/year)

Attest By:

_____

Title _____

Approved As to Form:

_____

_____

SELLER: _____

By: _____

_____

[Corporate Seal]

Attest: _____

Address for giving notice:

_____

_____

Agent for service of process:

_____

_____

_____

(If Seller is a corporation or a partnership, attach evidence of authority to sign.)

**EXHIBIT A-1** to Agreement Between BUYER and SELLER Dated:
_____

ASSIGNMENT OF CONTRACT; CONSENT TO ASSIGNMENT; AND ACCEPTANCE OF ASSIGNMENT

This assignment will be effective on the Effective Date of the Agreement between the Buyer and the construction contractor "Contractor". The Contract between the City of Sandy, Oregon ("Buyer") and _____ ("Seller" as "MSS") for furnishing Goods and Special Services under the Contract Documents entitled **Membrane Equipment Procurement – Alder Creek Water Treatment Plant Upgrade Project** is hereby assigned, transferred, and set over to _____, ("Contractor"). Contractor shall be totally responsible for the performance of Seller and for the duties, rights, and obligations of Buyer, not otherwise retained by Buyer, under the terms of the Contract between Buyer and Seller. Upon assignment of this Procurement Agreement, Seller agrees to perform its obligations and duties to Buyer under the supervision and control of and as a subcontractor or Seller to the Contractor.

ASSIGNMENT DIRECTED BY:

City of Sandy, Oregon

_____

(Buyer)

(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement.)

By: _____

Title: _____

Executed on _____/_____ /_____

ASSIGNMENT ACKNOWLEDGED AND ACCEPTED BY:

_____

Seller

(If Seller is a corporation, attach evidence of authority to sign.)

By: _____

(Signature)

_____

(Title)

ASSIGNMENT ACCEPTED BY:

_____

Contractor

(If Construction Contractor is a corporation attach evidence of authority to sign.)

By: _____

**EXHIBIT A-2** to Agreement Between Buyer and Seller
Dated: _____

AGREEMENT TO ASSIGNMENT BY SELLER'S SURETY

Surety hereby acknowledges and agrees that the Contract for furnishing Goods and Special Services under the Contract Documents entitled **Membrane Equipment Procurement – Alder Creek Water Treatment Plant Upgrade Project** by and between the City of Sandy, Oregon ("Buyer") and _____ _____ ("Seller as MSS") may be assigned, transferred, and set over to _____ _____ ("Contractor"), in accordance with Paragraph 11.02 of Agreement between Buyer and Seller.

Surety further agrees that, upon assignment of the Contract, the Contractor shall have all the rights of the Buyer under the Performance Bond.

Surety Company _____

(Corporate Seal)

By: _____
Signature and Title
(Attach Power of Attorney)

END OF SECTION

# SECTION 00 61 00 PERFORMANCE BOND FOR PROCUREMENT CONTRACT
## Document A312™ – 2010
## Conforms with The American Institute of Architects AIA Document 312

Bond Number:

*Performance Bond*

**CONTRACTOR:**
*(Name, legal status, and address)*

**SURETY:**
*(Name, legal status, and principal place of business)*

State of Inc: _____

**OWNER:**
*(Name, legal status, and address)*

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

**CONSTRUCTION CONTRACT**

Date: _____

Amount _____

Description: *(Name and location)*

City of Sandy, OR, Alder Creek Water Treatment Plant Upgrade Project

39250 Pioneer Boulevard, Sandy, OR 97055

**BOND**

Date: _____
*(Not earlier than Construction Contract Date)*

Amount: ☑ ☐

Modifications to this Bond: None See Section 16

**CONTRACTOR AS PRINCIPAL**
Company: *(Corporate Seal)*

**SURETY**
Company: (*Corporate Seal)*

Signature: _____

Name

And Title:

Signature: _____

Name

And Title:

*(Any additional signatures appear on the last page of this Performance Bond)*

*(FOR INFORMATION ONLY – Name, address, and telephone)*

**AGENT or BROKER:**

**OWNER'S REPRESENTATIVE:**
*(Architect, Engineer, or other party)*

§ **1** The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ **2** If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3..

§ **3** If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after.

- **.1** the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- **.2** the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- **.3** the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ **4** Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ **5** When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ **5.1** Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract,

§ **5.2** Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ **5.3** Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ **5.4** Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- **.1** After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- **.2** Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ **6** If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ **7** If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject

to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for:

**.1** the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract
**.2** additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
**.3** liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ **8** If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ **9** The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ **10** The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ **11** Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ **12** Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ **13** When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ **14 Definitions**

**§ 14.1 Balance of the Contract Price**. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made. including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ **14.2 Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ **14.3 Contractor Default**. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ **14.4 Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ **14.5 Contract Documents**. All the documents that comprise the agreement between the Owner and Contractor.

§ **15** If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ **16** Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

| **CONTRACTOR AS PRINCIPAL** | | **SURETY** | |
|---|---|---|---|
| Company: | *(Corporate Seal)* | Company: | *(Corporate Seal)* |
| Signature: _____ | | Signature: _____ | |
| Name and Title: | | Name and Title: | |
| Address | | Address | |

**SECTION 00 61 27 PROPOSAL BOND FORM**

# Document A310™ – 2010
# Conforms with The American Institute of Architects
# AIA Document 310

Bond Number:

*Bid Bond*

**CONTRACTOR:**
*(Name, legal status, and address)*

**SURETY:**
*(Name, legal status, and principal place of business)*

State of Inc: _____

**OWNER:**
*(Name, legal status, and address)*

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

**BOND AMOUNT:**

**PROJECT:**
*(Name, location or address, and Project number, if any)*

City of Sandy, Alder Creek Water Treatment Plant Upgrade Project - 2002006267
City of Sandy, c/o Jenny Coker
39250 Pioneer Blvd., Sandy, OR 97055
(503) 668-6927, Jcoker@ci.sandy.or.us

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null

and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of ,

| | |
|---|---|
| | *(Principal)* *(Seal)* |
| *(Witness)* | |
| | *(Title)* |
| | *(Surety)* *(Seal)* |
| *(Witness)* | |
| | *(Title)* |

**SECTION 00 61 50 PAYMENT BOND FOR PROCUREMENT CONTRACT**

# Document A312™ – 2010
# Conforms with The American Institute of Architects
# AIA Document 312

Bond Number:

*Payment Bond*

**CONTRACTOR:**
*(Name, legal status, and address)*

**SURETY:**
*(Name, legal status, and principal place of business)*

State of Inc: _____

**OWNER:**
*(Name, legal status, and address)*

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

**CONSTRUCTION CONTRACT**

Date: _____

Amount _____

Description: *(Name and location)*

City of Sandy, OR, Alder Creek Water Treatment Plant Upgrade Project
39250 Pioneer Boulevard, Sandy, OR 97055
(503) 688-6927, Jcoker@ci.sandy.or.us

**BOND**

Date: _____
*(Not earlier than Construction Contract Date)*

Amount:

Modifications to this Bond: ☑ None ☐ See Section 18

| **CONTRACTOR AS PRINCIPAL** | | **SURETY** | |
|---|---|---|---|
| Company: | *(Corporate Seal)* | Company: | (*Corporate Seal)* |
| Signature: | | Signature: | |
| Name | | Name | |
| And Title: | | And Title: | |

*(Any additional signatures appear on the last page of this Payment Bond)*

*(FOR INFORMATION ONLY – Name, address, and telephone)*

| **AGENT or BROKER:** | **OWNER'S REPRESENTATIVE:** *(Architect, Engineer, or other party)* |
|---|---|

§ **1** The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ **2** If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ **3** If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ **4** When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ **5** The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ **5.1** Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ **5.2** Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ **6** If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ **7** When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ **7.1** Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ **7.2** Pay or arrange for payment of any undisputed amounts.

§ **7.3** The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ **8** The Surety’s total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney’s fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ **9** Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this bond, subject to the Owner’s priority to use the funds for the completion of the work.

§ **10** The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ **11** The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ **12** No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ **13** Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ **14** When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ **15** Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ **16 Definitions**

§ **16.1 Claim**. A written statement by the Claimant including at a minimum:

.1 the name of the Claimant;
.2 the name of the person for whom the labor was done, or materials or equipment furnished;
.3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
.4 a brief description of the labor, materials or equipment furnished;
.5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
.6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
.7 the total amount of previous payments received by the Claimant; and
.8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ **16.2 Claimant**. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to Furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of the Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ **16.3 Construction Contract**. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ **16.4 Owner Default**. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms

of the Construction Contract.

§ **16.5 Contract Documents**. All the documents that comprise the agreement between the Owner and Contractor.

§ **17** If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ **18** Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

| **CONTRACTOR AS PRINCIPAL** | | **SURETY** | |
|---|---|---|---|
| Company: | *(Corporate Seal)* | Company: | *(Corporate Seal)* |
| Signature: _____ | | Signature: _____ | |
| Name and Title: | | Name and Title: | |
| Address | | Address | |

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

# STANDARD GENERAL CONDITIONS FOR PROCUREMENT CONTRACTS

*Prepared by*

**ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE**
and

Issued and Published Jointly By

AMERICAN CONSULTING ENGINEERS COUNCIL

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This document has been approved and endorsed by

The Associated General Contractors of America

and the

Construction Specifications Institute

EJCDC No. P-700 (2000 Edition)

These Standard General Conditions For Procurement Contracts have been prepared for use with the Suggested Instructions to Bidders For Procurement Contracts (EJCDC No. P-200 2000 Edition), the Suggested Form of Agreement Between Buyer and Seller For Procurement Contracts (EJCDC No. P520, 2000 Edition), and the Guide to Preparation of Supplementary Conditions For Procurement Contracts (EJCDC No. P-800, 2000 Edition). Their provisions are interrelated and a change in one may necessitate a change in the others. Additional information concerning the use of the EJCDC Procurement Documents may be found in the Commentary on Procurement Documents (EJCDC No. P-001).



NOTE:

EJCDC publications may be ordered from any of the three sponsoring organizations above and from CSI headquarters at 99 Canal Center Plaza, Suite 300, Alexandria, VA 22314.

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

*1.01 Defined Terms*

A. Whenever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to the singular or plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Those written or graphic instruments issued prior to the opening of Bids in accordance with the Bidding Requirements which clarify or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument signed by both Buyer and Seller covering the Goods and Special Services and which lists the Contract Documents in existence on the Effective Date of the Agreement.

3. *Application for Payment*--The form acceptable to Buyer which is used by Seller in requesting progress and final payments and which is accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*--An offer or proposal submitted on the prescribed form setting forth the prices for the Goods and Special Services to be provided.

5. *Bidder*--A person who submits a Bid directly to Buyer.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Form of Bid security, if any, and Bid Form with any supplements.

8. *Buyer*--The person or public entity purchasing the Goods and Special Services.

9. *Change Order*--A document recommended by Engineer which is signed by Seller and Buyer and authorizes an addition, deletion, or revision to the Contract Documents or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A written demand or assertion by Buyer or Seller seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract.

11. *Contract*--The entire and integrated written agreement between Buyer and Seller concerning the Goods and Special Services. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--Those items listed in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Files in electronic media format of text, data, graphics, and the like are not Contract Documents, and may not be relied on by Seller. Approved Shop Drawings and other Seller's submittals are not Contract Documents.

13. *Contract Price*-- The moneys payable by Buyer to Seller for furnishing the Goods and Special Services in accordance with the Contract Documents as stated in the Agreement.

14. *Contract Times*--The times stated in the Agreement by which the Goods must be delivered and Special Services must be furnished.

15. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, intent, and character of the Goods and Special Services to be furnished by Seller.

16. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

17. *Engineer*--The person designated as such in the Agreement.

18. *Field Order*--A written order issued by Engineer which requires minor changes in the Goods or Special Services but which does not involve a change in the Contract Price or Contract Times.

19. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

20. *Goods*--The tangible and movable personal property that is described in the Contract Documents, regardless of whether the property is to be later attached to realty.

21. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances,

codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

22. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to the Contract Times.

23. *Notice of Award*--The written notice by Buyer to the apparent Successful Bidder stating that upon timely compliance by the apparent Successful Bidder with the conditions precedent listed therein, Buyer will sign and deliver the Agreement.

24. *Notice to Proceed*-- A written notice given by Buyer to Seller fixing the date on which the Contract Times commence to run and on which Seller shall start to perform under the Contract.

25. *Point of Destination* --The specific address of the location where delivery of the Goods shall be made as stated in the Agreement.

26. *Project*--The total undertaking of which the Goods and Special Services to be provided under the Contract are a part.

27. *Project Manual*--The bound documentary information prepared for bidding and furnishing the Goods and Special Services. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

28. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Goods and which establish the standards by which such portion of the Goods or Special Services will be judged.

29. *Seller*--The person furnishing the Goods and Special Services.

30. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Seller and submitted by Seller to illustrate some portion of the Goods or Special Services.

31. *Special Services*--Services associated with the Goods to be furnished by Seller as required by the Contract Documents.

32. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards and workmanship as applied to the furnishing of the Goods and Special Services, and certain administrative details applicable thereto.

33. *Successful Bidder*--The lowest responsible Bi submitting a responsive Bid, to whom Buyer makes an award.

34. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

35. *Written Amendment*--A written statement modifying the Contract Documents, signed by Buyer and Seller on or after the Effective Date of the Agreement and normally dealing with the administrative aspects of the Contract Documents.

*1.02* Terminology

A. *Intent of Certain Terms or Adjectives*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Goods or Special Services. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Goods or Special Services for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to Engineer any duty or authority to supervise or direct the furnishing of Goods or Special Services or any duty or authority to undertake responsibility contrary to any other provision of the Contract Documents.

2. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

3. The word "non-conforming" when modifying the words "Goods" or "Special Services", refers to Goods or Special Services that fail to conform to the Contract Documents.

4. The word "receipt" when referring to the Goods, shall mean the physical taking and possession by the Buyer under the conditions specified in Paragraph 8.01.B.3.

B. *Day*

1. The word "day" shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

## ARTICLE 2 - PRELIMINARY MATTERS

*2.01 Delivery of Bonds*

A. When Seller delivers the executed Agreements to Buyer, Seller also shall deliver such bonds as Seller may be required to furnish.

*2.02* Copies of Documents

A. Buyer shall furnish Seller up to five copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

*2.03 Commencement* of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

*2.04 Designated* Representatives

A. Buyer and Seller shall each designate its representative at the time the Agreement is signed. Each representative shall have full authority to act on behalf of and make binding decisions in any matter arising out of or relating to the Contract.

*2.05* Before Starting Fabrication/Assembly of Goods

A. *Seller's Review of Contract Documents:* Before commencing performance of the Contract, Seller shall carefully study and compare the Contract Documents and check and verify pertinent requirements therein and, if specified, all applicable field measurements. Seller shall promptly report in writing to Buyer and Engineer any conflict, error, ambiguity or discrepancy which Seller may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any work affected thereby.

*2.06* Progress Schedule

A. Within 15 days after the Contract Times start to run, Seller shall submit to Buyer and Engineer an acceptable progress schedule of activities, including at a minimum, Shop Drawing and Sample submittals, tests, and deliveries as required by the Contract Documents. No progress payment will be made to Seller until an acceptable schedule is submitted to Buyer and Engineer.

B. The progress schedule will be acceptable to Buyer and Engineer if it provides an orderly progression of the submittals, tests, and deliveries to completion within the specified Milestones and the Contract Times. Such acceptance will not impose on Buyer or Engineer responsibility for the progress schedule, for sequencing, scheduling, or progress of the work nor interfere with or relieve Seller from Seller's full responsibility therefor. Such acceptance shall not be deemed to acknowledge the reasonableness and attainability of the schedule.

*2.07 Preliminary* Conference

A. Within 20 days after the Contract Times start to run, a conference attended by Seller, Buyer, Engineer and others as appropriate will be held to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedule referred to in Paragraph 2.06.A., procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

## ARTICLE 3 - CONTRACT DOCUMENTS: INTENT AND AMENDING

*3.01* Intent

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided, whether or not specifically called for, at no additional cost to Buyer.

C. Clarifications and interpretations of, or notifications of minor variations and deviations in, the Contract Documents, will be issued by Engineer as provided in Article 9.

*3.02* Laws and Regulations, Standards, Specifications and Codes

A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws and Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws and Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

B. No provision of any such standard, specification, manual or code, or any instruction of a supplier shall be effective to change the duties or responsibilities of Buyer or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be

effective to assign to Buyer or Engineer, or any of their consultants, agents, or employees any duty or authority to supervise or direct the performance of Seller's obligations or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

*3.03* Reporting and Resolving Discrepancies

A. *Reporting Discrepancies:* If, during the performance of the Contract, Seller discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Contract or of any standard, specification, manual or code, or of any instruction of any supplier, Seller shall promptly report it to Buyer in writing for Engineer's review. Seller shall not proceed with the furnishing of the Goods or Special Services affected thereby until an amendment to or clarification of the Contract Documents has been issued. Seller shall not be liable to Buyer or Engineer for failure to report any such conflict, error, ambiguity, or discrepancy unless Seller knew or reasonably should have known thereof.

B. *Resolving Discrepancies:* Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

1. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

2. the provisions of any Laws or Regulations applicable to the furnishing of the Goods and Special Services (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

*3.04* Amending and Clarifying Contract Documents

A. The Contract Documents may be amended to provide for additions, deletions, and revisions to the Goods or Special Services or to modify the terms and conditions thereof by a Written Amendment or a Change Order.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Goods or Special Services not affecting Contract Price or Contract Times may be authorized, by one or more of the following ways: 1) a Field Order; 2) Engineer's approval of a Shop Drawing pursuant to Paragraph 5.06.D.2; or 3) Engineer's written interpretation or clarification.

## ARTICLE 4 - BONDS AND INSURANCE

*4.01 Bonds*

A. Seller shall furnish performance and payment bonds each in an amount at least equal to the Contract Price, to Buyer. The bonds shall be delivered in accordance with Paragraph 2.01 and shall remain in effect at least one year after the date final payment is due, except as provided otherwise by Laws or Regulations.

B. The bonds shall be issued in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations and shall be executed by a surety named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on a bond is declared bankrupt or becomes insolvent or its right to do business is terminated in the state where the Project is located or it ceases to meet the requirements of Paragraph 4.01.B, Seller shall provide another bond and surety which comply with those requirements within 20 days, at Seller's expense.

*4.02 Insurance*

A. Seller shall provide insurance of the types and coverages and in the amounts stipulated in the Supplementary Conditions.

## ARTICLE 5 - SELLER'S RESPONSIBILITIES

*5.01 Supervision and Superintendence*

A. Seller shall be solely responsible for the means, methods, techniques, sequences, and procedures used in performing its obligations. Seller shall be responsible to see that the completed Goods and Special Services conform to the Contract Documents.

*5.02* Labor, *Materials* and Equipment

A. Seller shall provide competent, qualified and trained personnel in all aspects of its performance of the Contract.

B. All equipment, products and material incorporated into the Goods shall be as specified, or if not specified, shall be new, of good quality and protected, assembled, used, connected, applied, cleaned and conditioned in accordance with the original manufacturer's instructions, except as otherwise may be provided in the Contract Documents.

*5.03* Compliance with Laws and Regulations, Standards, Specifications and Codes

A. Seller shall comply with all Laws and Regulations applicable to the furnishing of the Goods and Special Services.

*5.04* Or *Equals*

A. Whenever an item of material or equipment to be incorporated into the Goods is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier or manufacturer, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item is permitted, other items of material or equipment or material or equipment of other suppliers or manufacturers may be submitted to Buyer for Engineer's review.

1. If in Engineer's sole discretion, such an item of material or equipment proposed by Seller is functionally equal to that named and sufficiently similar so that no change in related work will be required, it may be considered by Engineer as an "or-equal" item.

2. For the purposes of this paragraph, a proposed item of material or equipment may be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment, Engineer determines that: 1) it is at least equal in quality, durability, appearance, strength, and design characteristics; and 2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; and

b. Seller certifies that: 1) there is no increase in any cost including capital, installation or operating to Buyer; and 2) the proposed item will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

B. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraph 5.04.A. Engineer will be the sole judge of acceptability. No "or-equal" will be ordered, manufactured or utilized until Engineer's review is complete, which will be evidenced by an approved Shop Drawing. Engineer will advise Buyer and Seller in writing of any negative determination. Notwithstanding Engineer's approval of an "or-equal" item, Seller shall remain obligated to comply with the requirements of the Contract Documents.

C. *Special Guarantee:* Buyer may require Seller to furnish at Seller's expense a special performance guarantee or other surety with respect to any such proposed "or-equal."

D. *Data:* Seller shall provide all data in support of any such proposed "or-equal" at Seller's expense.

*5.05 Taxes*

A. Seller shall be responsible for all taxes and duties arising out of the sale of the Goods and the furnishing of Special Services. All taxes are included in the Contract Price.

*5.06* Shop Drawings and Samples

A. Seller shall submit Shop Drawings and Samples to Buyer for Engineer's review and approval in accordance with the schedule required in Paragraph 2.06.A. All submittals will be identified as required and furnished in the number of copies specified in the Contract Documents. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Seller proposes to provide.

B. Where a Shop Drawing or Sample is required by the Contract Documents, any related work performed prior to Engineer's approval of the pertinent submittal will be at the sole expense and responsibility of Seller.

C. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, Seller shall have determined and verified:

a. all field measurements (if required), quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto; and

b. that all materials are suitable with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the furnishing of Goods and Special Services.

2. Seller shall also have reviewed and coordinated each Shop Drawing or Sample with the Contract Documents.

3. Each submittal shall include a written certification from Seller that Seller has reviewed the subject submittal and confirmed that it is in compliance with the requirements of the Contract Documents. Both Buyer and Engineer shall be entitled to rely on such certification from Seller.

4. With each submittal, Seller shall give Buyer and Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both in a written communication separate from the submittal and by specific notation on each Shop Drawing or Sample.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples.

2. Engineer's approval of Shop Drawings or Samples will be subject to the standard of Paragraph 1.02.A.1. Engineer's approval will not relieve Seller from responsibility for any variation from the requirements of the Contract Documents unless Seller has in writing called Engineer's attention to each such variation at the time of each submittal as required by Paragraph 5.06.C.1. and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval.

E. Resubmittal Procedures

1. Seller shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. Seller shall direct specific attention in writing to any revisions other than the corrections called for by Engineer on previous submittals.

*5.07 Continuing Performance*

A. Seller shall adhere to the progress schedule established in accordance with Paragraph 2.06.A., and the Goods shall be delivered and the Special Services furnished within the Contract Times specified in the Agreement.

B. Seller shall carry on the work and adhere to the progress schedule during all disputes or disagreements with Buyer. No work shall be delayed or postponed pending resolution of any disputes or disagreements.

*5.08 Seller's Warranties and Guarantees*

A. Seller warrants and guarantees to Buyer that the title to the Goods conveyed shall be proper, its transfer rightful, and free from any security interest, lien, or other encumbrance.

B. Seller warrants and guarantees to Buyer that all Goods and Special Services will conform with the Contract Documents, including any Samples approved by Engineer, and the Goods will be of merchantable quality. Engineer shall be entitled to rely on representation of Seller's warranty and guarantee.

C. Seller's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, improper modification or improper maintenance or operation by persons other than Seller, or

2. normal wear and tear under normal usage.

D. Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Goods or Special Services that are conforming, or a release of Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents:

1. observations by Buyer or Engineer;

2. recommendation by Engineer or payment by Buyer of any progress or final payment;

3. use of the Goods by Buyer;

4. any acceptance by Buyer (subject to the provisions of Paragraph 8.02.D.1) or any failure to do so;

5. the issuance of a notice of acceptance by Buyer pursuant to the provisions of Article 8;

6. any inspection, test or approval by others; or

7. any correction of non-conforming Goods or Special Services by Buyer.

E. Buyer shall within a reasonable time notify Seller of any breach of Seller's warranties or guarantees. If Buyer receives notice of a suit or claim as a result of such breach, Buyer also may give Seller notice in writing to defend such suit or claim. If Seller fails to defend such suit or claim, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit.

*5.09 Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, and their officers, directors, shareholders, partners, employees, agents, consultants, contractors and subcontractors from any and all claims, costs, losses, and demands or judgments for damages for claims (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or relating to a negligent act or omission or the breach of any obligation under this Contract by Seller, or its officers, directors, shareholders, partners, employees, agents, consultants, contractors or subcontractors, or anyone for whom Seller is responsible, provided that any such claim, cost, loss, or damage;

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Goods or Special Services themselves), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of Seller or any individual or entity directly or indirectly employed to furnish any of the Goods or Special Services or anyone for whose acts Seller may be liable, regardless of whether or not caused in part by any

negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. The indemnification obligations of Seller under paragraph 5.09.A shall not extend to the liability of Engineer and Engineer's consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

## ARTICLE 6 - SHIPPING AND DELIVERY

*6.01 Shipping*

A. Seller shall select the carrier and bear all costs of packaging, transportation, insurance, special handling and any other costs associated with shipment and delivery.

*6.02 Delivery*

A. Seller shall deliver the Goods F.O.B. the Point of Destination in accordance with the Contract Times set forth in the Agreement, or other date agreed to by Buyer and Seller.

B. Seller shall provide written notice to Buyer at least 15 days before shipment of the manner of shipment and the anticipated delivery date. The notice shall also include any instructions concerning special equipment or services required at the Point of Destination to unload and care for the Goods. Seller shall also require the carrier to give Buyer at least 24 hours notice by telephone prior to the anticipated hour of delivery.

C. Buyer will be responsible and bear all costs for unloading the Goods from carrier.

D. Buyer will assure that adequate facilities are available to receive delivery of the Goods during the Contract Times set forth in the Agreement, or another date agreed by Buyer and Seller.

E. No partial deliveries shall be allowed, unless permitted or required by the Contract Documents or agreed to in writing by Buyer.

*6.03 Risk of Loss*

A. Risk of loss and insurable interests transfer from Seller to Buyer upon Buyer's receipt of the Goods.

B. Notwithstanding the provisions of Paragraph 6.0 if Buyer rejects the Goods as non-conforming, the risk of loss on such Goods shall remain with Seller until Seller corrects the non-conformity or Buyer accepts the Goods.

## ARTICLE 7 - CHANGES: SCHEDULE AND DELAY

*7.01 Changes in the Goods and Special Services*

A. Buyer may at any time, without notice to any surety, make changes in the Contract Documents within the general scope of the Contract.

B. If any such change or action by Buyer affects the Contract Price or Contract Times, Seller shall notify Buyer within 15 days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to Buyer within 45 days after such occurrence. If Seller fails to do so, Seller waives any Claim for such adjustment.

C. Seller shall not suspend performance while Buyer and Seller are in the process of making such changes and any related adjustments.

*7.02 Changes in Laws and Regulations*

A. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of furnishing the Goods and Special Services shall be the subject of an adjustment in Contract Price or Contract Times. If Buyer and Seller are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 9.06.A.

*7.03* Changing *Contract* Price or Contract Times

A. The Contract Price or Contract Times may only be changed by:

1. a Change Order;

2. a Written Amendment; or

3. a written unilateral order of Buyer, in which case Seller shall be entitled to an equitable adjustment in Contract Price or Contract Times for any reasonable and necessary costs or delays incurred by Seller to accommodate such a change.

B. If Seller is prevented from delivering the Goods or performing the Special Services within the Contract Times for any unforeseen reason beyond its control and not attributable to its actions or inactions, then Seller shall be entitled to an adjustment of the Contract Times to the extent attributable to such reason. Such reasons include fire, floods, epidemics, abnormal weather conditions, acts of God, acts of war, directions by government authority, and other like matters. If such an event occurs and delays

Seller's performance, Seller shall notify Buyer in writing within 15 days of the beginning of the event causing the delay, stating the reason therefor.

C. Contract Times will not be modified for delays within the control of Seller, including labor strife, transportation shortages or delays at Seller's facilities. Delays attributable to and within the control of Seller's subcontractors or suppliers shall be deemed to be delays within the control of Seller.

D. If Seller is prevented from delivering the Goods or furnishing the Special Services within the Contract Times due to the actions or inactions of Buyer, Seller shall be entitled to any reasonable and necessary additional costs arising out of such delay to the extent directly attributable to Buyer.

E. Neither Buyer nor Seller shall be entitled to any damages arising from delays which are beyond the control of both Buyer and Seller, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, acts of war, direction by government authority, and other like matters.

## ARTICLE 8 - BUYER'S RIGHTS

*8.01 Inspections and Testing*

A. General

1. Buyer shall have the right to perform, or cause to be performed, reasonable inspections and require reasonable tests of the Goods at Seller's facility, and at the Point of Destination. Seller shall allow Buyer a reasonable time to perform such inspections or tests.

2. Seller shall bear all expenses, except for travel, lodging and subsistence expenses of Buyer's representatives, for inspections and tests at Seller's facility, but Buyer shall be entitled to reimbursement from Seller of travel, lodging and subsistence expenses of Buyer's representatives if the Goods are non-conforming.

3. Buyer shall bear all expenses, except for travel, lodging and subsistence expenses of Seller's representatives, for inspections and tests at the Point of Destination, but Buyer shall be entitled to reimbursement from Seller for Buyer's expenses for reinspection or retesting if, on the basis of an initial inspection or testing, the Goods are determined to be non-conforming.

4. Seller shall provide Buyer 30 days written notice of the readiness of the Goods for all inspections, tests, or approvals which the Contract Documents specify are to be observed by Buyer prior to shipment.

5. Buyer will give Seller timely notice of all specified tests, inspections and approvals of the Goods which are to be conducted at the Point of Destination.

6. If, on the basis of any inspections or testing, the Goods appear to be conforming, Buyer will give Seller prompt notice thereof. If on the basis of said inspections or testing, the Goods appear to be non-conforming, Buyer will give Seller prompt notice thereof and will advise Seller of the remedy Buyer elects under the provisions of Paragraph 8.02.

7. Neither payments made by Buyer to Seller prior to any tests or inspections, nor any tests or inspections shall constitute acceptance of non-conforming Goods, or prejudice Buyer's rights under the Contract.

B. Inspection on Delivery

1. Buyer or Engineer will inspect the Goods upon delivery solely for purposes of identifying the Goods and general verification of quantities and observation of apparent condition in order to provide a basis for a progress payment. Such inspection will not be construed as final or as receipt of any Goods and Special Services that, as a result of subsequent inspections and tests, are determined to be non-conforming.

2. Within ten days of such inspection, Buyer shall provide Seller with written notice of Buyer's determination regarding conformity of the Goods. In the event Buyer does not provide such notice, it will be presumed that the Goods appear to be conforming.

3. If, on the basis of the inspection specified in Paragraph 8.01.B.1, the Goods appear to be conforming, Buyer's notice thereof to Seller will acknowledge receipt of the Goods.

C. Final Inspection

1. After all of the Goods have been incorporated into the Project, tested in accordance with such testing requirements as are specified, and are functioning as intended, Buyer or Engineer will make a final inspection.

2. If, on the basis of the final inspection, the Goods are conforming, Buyer's notice thereof will constitute Buyer's acceptance of the Goods.

3. If, on the basis of the final inspection, the Goods are non-conforming, Buyer will identify the non-conformity in writing.

*8.02 Non-Conforming Goods or Special Services*

A. If, on the basis of inspections and testing prior to delivery, the Goods appear to be non-conforming, or if at any time after Buyer has acknowledged receipt of delivery and before the expiration of the correction period described in Paragraph 8.03, Buyer determines that the Goods are non-conforming, Seller shall promptly, without cost to Buyer and in response to written instructions from Buyer, either

correct such non-conforming Goods, or, if rejected by Buyer, remove and replace the non-conforming Goods with conforming Goods, including all work required for reinstallation.

B. Buyer's Rejection of Non-Conforming Goods

1. If Buyer elects to reject the Goods in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Goods. If Goods have been delivered to Buyer, Seller shall promptly, and within the Contract Times, remove and replace the rejected Goods.

2. Seller shall bear all costs, losses and damages attributable to the removal and replacement of the non-conforming Goods as provided in Paragraph 8.02.E.

3. Upon rejection of the Goods, Buyer retains a security interest in the Goods or to the extent of any payments made and expenses incurred in their testing and inspection.

C. Remedying Non-Conforming Goods or Special Services

1. If Buyer elects to permit the Seller to modify the Goods to remove the non-conformance, Seller shall promptly provide a schedule for such modifications and shall make the Goods conforming within a reasonable time.

2. If Buyer notifies Seller in writing that any of the Special Services are non-conforming, Seller shall promptly provide conforming services acceptable to Buyer. If Seller fails to do so, Buyer may delete the Special Services and reduce the Contract Price a commensurate amount.

D. Buyer's Acceptance of Non-Conforming Goods

1. Instead of requiring correction or removal and replacement of non-conforming Goods discovered either before or after final payment, Buyer may accept the non-conforming Goods. Seller shall bear all costs, losses, and damages attributable to Buyer's evaluation of and determination to accept such non-conforming Goods as provided in Paragraph 8.02.E.

E. Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, retesting and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods or Special Services, including the correction or removal and replacement of the non-conforming Goods and the replacement of property of Buyer and others destroyed by the correction or removal and replacement of the non-conforming Goods, or the obtaining of conforming Special Services from others.

*8.03 Correction Period*

A. Seller's responsibility for correcting all non-conformities in the Goods will extend for a period of one year after the earlier of the date on which Buyer has placed the Goods in continuous service or the date of final payment, or for such longer period of time as may be prescribed by Laws or Regulations or by the terms of any specific provisions of the Contract Documents.

## ARTICLE 9 - ROLE OF ENGINEER

*9.01 Duties and Responsibilities*

A. The duties and responsibilities and the limitations of authority of Engineer are set forth in the Contract Documents.

*9.02 Clarifications and* Interpretations

A. Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents as Engineer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications and interpretations will be binding on Buyer and Seller. If either Buyer or Seller believes that a written clarification or interpretation justifies an adjustment in the Contract Price or Contract Times, either may make a Claim therefor.

*9.03 Authorized Variations*

A. Engineer may authorize minor deviations or variations in the Contract Documents by: 1) issuance of approved Shop Drawings when such change or deviation was duly noted by Seller as required in Paragraph 5.06.C.4, or 2) a Field Order.

*9.04 Rejecting Non-Conforming Goods and Special Services*

A. Engineer will have the authority to disapprove or reject Goods or Special Services which Engineer believes to be non-conforming.

*9.05 Decisions* on Requirements of Contract Documents

A. Engineer will be the initial interpreter of the Contract Documents and judge of the acceptability of the Goods and Special Services. Claims, disputes and other matters relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to Seller's performance will be referred initially to Engineer in writing with a request for a formal decision in accordance with this paragraph.

B. When functioning as interpreter and judge under this Paragraph 9.05, Engineer will not show partiality to Buyer

or Seller and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by Engineer pursuant to this Paragraph 9.05 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in Paragraph 10.07) will be a condition precedent to any exercise by Buyer or Seller of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

*9.06 Claims* and Disputes

A. *Notice*: Written notice of each Claim, dispute or other matter relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to Seller's performance shall be delivered by the claimant to Engineer and the other party to the Agreement within 15 days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to Engineer and the other party within 45 days after such occurrence unless Engineer allows an additional period of time to ascertain more accurate data.

B. *Engineer's Decision*: Engineer will render a decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. Engineer's written decision on such Claim, or dispute, or other matter will be final and binding upon Buyer and Seller unless:

1. an appeal from Engineer's decision is made within the time limits and in accordance with the dispute resolution procedures set forth in Article 13; or

2. if no such dispute resolution procedures have been set forth, a written notice of intention to appeal is delivered by Buyer or Seller to the other and to Engineer within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision (unless otherwise agreed to in writing by Buyer and Seller), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If Engineer does not render a formal decision in writing within the time stated in Paragraph 9.06.B., a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

## ARTICLE 10 - PAYMENT

*10.01 Applications for Progress Payments*

A. Seller shall submit to Buyer for Engineer's re Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Contract Documents and also as Buyer or Engineer may reasonably require. The timing and amounts of progress payments shall be as stipulated in the Agreement.

1. The first application for Payment will be submitted after review and approval by Engineer of all Shop Drawings and of all Samples required by the Contract Documents.

2. The second Application for Payment will be submitted after receipt of the Goods has been acknowledged in accordance with Paragraph 8.01.B and will be accompanied by a bill of sale, invoice or other documentation satisfactory to Buyer warranting that Buyer has rightfully received good title to the Goods from Seller and that the Goods are free and clear of all liens. Such documentation will include releases and waivers from all parties with viable lien rights. In the case of multiple deliveries of Goods, additional Applications for Payment accompanied by the required documentation will be submitted as Buyer acknowledges receipt of additional items of the Goods.

*10.02 Review of Applications for Progress Payments*

A. Engineer will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Buyer, or return the Application to Seller indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Seller may make the necessary corrections and resubmit the Application.

1. Engineer's recommendation of payment requested in the first Application for Payment will constitute a representation by Engineer, based on Engineer's review of the Application for Payment and the accompanying data, that the Shop Drawings and Samples have been reviewed and approved as required by the Contract Documents and Seller is entitled to payment of the amount recommended.

2. Engineer's recommendation of payment requested in the Application for Payment submitted upon Buyer's acknowledgment of receipt of the Goods will constitute a representation by Engineer, based on Engineer's review of the Application for Payment and the accompanying data Seller is entitled to payment of the amount recommended. Such recommendation will not constitute a representation that Engineer has made a final inspection of the Goods, that the Goods are free from non-conformities, acceptable or in conformance with the Contract Documents, that Engineer has made any investigation as to Buyer's title to the Goods, that exhaustive or continuous inspections have been made to check the quality or the quantity of the Goods beyond the responsibilities specifically assigned to Engineer in the Contract Documents or that there may not

be other matters or issues between the parties that might entitle Seller to additional payments by Buyer or Buyer to withhold payment to Seller.

3. Engineer may refuse to recommend that all or any part of a progress payment be made, or Engineer may nullify all or any part of any payment previously recommended if, in Engineer's opinion, such recommendation would be incorrect or if on the basis of subsequently discovered evidence or subsequent inspections or tests Engineer considers such refusal or nullification necessary to protect Buyer from loss because the Contract Price has been reduced, Goods are found to be non-conforming, or Seller has failed to furnish acceptable Special Services.

*10.03 Amount and Timing of Progress Payments*

A. Subject to Paragraph 10.02.A., the amounts of the progress payments will be as provided in the Agreement. Buyer shall within 30 days after receipt of each Application for Payment with Engineer's recommendation pay Seller the amount recommended; but, in the case of the Application for Payment upon Buyer's acknowledgment of receipt of the Goods, said 30-day period may be extended for so long as is necessary (but in no event more than 60 days) for Buyer to examine the bill of sale and other documentation submitted therewith. Buyer shall notify Seller promptly of any deficiency in the documentation and shall not unreasonably withhold payment.

*10.04 Suspension of or Reduction in Payment*

A. Buyer may suspend or reduce the amount of progress payments, even though recommended for payment by Engineer, under the following circumstances:

1. Buyer has reasonable grounds to conclude that Seller will not furnish the Goods or the Special Services in accordance with the Contract Documents,

2. Buyer has requested in writing assurances from Seller that the Goods or Special Services will be delivered or furnished in accordance with the Contract Documents, and Seller has failed to provide adequate assurances within ten days of Buyer’s written request.

B. If Buyer refuses to make payment of the full amount recommended by Engineer, Buyer will provide Seller and Engineer immediate written notice stating the reason for such action and promptly pay Seller any amount remaining after deduction of the amount withheld. Buyer shall promptly pay Seller the amount withheld when Seller corrects the reason for such action to Buyer’s satisfaction.

*10.05 Final Application for Payment*

A. After Seller has corrected all non-conformities to the satisfaction of Buyer and Engineer, furnished all Special Services, and delivered all documents required by the Contract Documents, Engineer will issue to Buyer and Seller a notice of acceptability. Seller may then make application for final payment following the procedure for progress payments. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents, a list of all unsettled claims and such other data and information as Buyer or Engineer may reasonably require.

*10.06 Final Payment*

A. If, on the basis of the review of the final Application for Payment and accompanying documentation, Engineer is satisfied that the Goods and Special Services have been furnished in accordance with the Contract Documents, and that Seller's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, recommend in writing final payment subject to the provisions of Paragraph 10.07 and present the Application to Buyer. Otherwise, Engineer will return the Application to Seller, indicating the reasons for refusing to recommend final payment, in which case Seller shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, Buyer shall, within 30 days after receipt thereof, pay Seller the amount recommended by Engineer.

*10.07 Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Buyer against Seller, except Claims arising from unsettled liens and Claims, from non-conformities in the Goods or Special Services appearing after final payment, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Seller's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Seller against Buyer other than those previously made in accordance with the requirements herein and expressly noted in writing by Seller as still unsettled in its final Application for Payment.

## ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION

*11.01 Cancellation*

A. Buyer has the right to cancel the Contract, without cause, at any time prior to delivery of the Goods by written notice. Cancellation pursuant to the terms of this paragraph shall not constitute a breach of contract by Buyer. Upon cancellation:

1. Buyer shall pay Seller for Goods, specially manufactured for the Project, plus any documented

reasonable direct and indirect costs incurred by Seller in producing such Goods not recovered by payment for the reasonable value of the Goods.

2. For Goods which are not specially manufactured for the Project, Seller shall be entitled to a restocking charge of 10 percent of the unpaid Contract Price of such Goods.

*11.02 Suspension of Performance by Buyer*

A. Buyer has the right to suspend performance of the Contract, without cause, by written notice. Upon suspension under this paragraph, Seller shall be entitled to an increase in the Contract Times and Contract Price caused by the suspension, provided that performance would not have been suspended or delayed for causes attributable to Seller.

*11.03 Suspension of Performance by Seller*

A. Subject to the provisions of Paragraph 5.07.B, Seller may suspend the furnishing of the Goods and Special Services only under the following circumstance:

1. Seller has reasonable grounds to conclude that Buyer will not perform its future payment obligations under the Contract. ("Reasonable grounds" shall not include a pending dispute or disagreement with Buyer) and,

2. Seller has requested in writing assurances from Buyer that future payments will be made in accordance with the Contract, and Buyer has failed to provide such assurances within ten days of Seller's written request.

*11.04 Breach and Termination*

A. Buyer's Breach

1. Buyer shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including but not limited to:

a. wrongful rejection or revocation of Buyer's acceptance of the Goods,

b. failure to make payments in accordance with the Contract Documents, or

c. wrongful repudiation of the Contract.

2. Seller shall have the right to terminate the Contract for cause by declaring a breach should Buyer fail to comply with any material provisions of the Contract. Upon termination, Seller shall be entitled to all remedies provided by Laws and Regulations.

a. In the event Seller believes Buyer is in breach of its obligations under the Contract, Seller shall provide Buyer with reasonably prompt written n setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Buyer shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Seller may grant in writing) within which to cure the alleged breach.

B. Seller's Breach

1. Seller shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including, but not limited to:

a. failure to deliver the Goods or perform the Special Services in accordance with the Contract Documents,

b. wrongful repudiation of the Contract, or

c. delivery or furnishing of non-conforming Goods or Special Services.

2. Buyer may terminate Seller's right to perform the Contract for cause by declaring a breach should Seller fail to comply with any material provision of the Contract Documents. Upon termination, Buyer shall be entitled to all remedies provided by Laws and Regulations.

a. In the event Buyer believes Seller is in breach of its obligations under the Contract, and except as provided in Paragraph 11.04.B.2.b, Buyer shall provide Seller with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Seller shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure the alleged breach.

b. If and to the extent that Seller has provided a performance bond under the provisions of Paragraph 4.01, the notice and cure procedures of that bond, if any, shall supersede the notice and cure procedures of Paragraph 11.04.B.2.a.

## ARTICLE 12 - LICENSES AND FEES

*12.01 Intellectual Property and License Fees*

A. Unless specifically stated elsewhere in the Contract Documents, Seller is not transferring any intellectual property rights, patent rights, or licenses for the Goods delivered. However, in the event the Seller is manufacturing to Buyer's design, Buyer retains all intellectual property rights in such design.

B. Seller shall pay all license fees and royalties and assume all costs incident to the use or the furnishing of the

Goods, unless specified otherwise by the Contract Documents.

*12.02 Seller's Infringement*

A. Subject to Paragraph 12.01.A, Seller shall indemnify and hold harmless Buyer, Engineer and their officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement or alleged infringement of any United States or foreign patent or copyright by any of the Goods delivered hereunder.

B. In the event of suit or threat of suit for intellectual property infringement, Buyer will notify Seller within a reasonable time of receiving notice thereof.

C. Upon written demand from Buyer, Seller shall be given the opportunity to defend the claim or suit, including negotiating a settlement. Seller shall have control over such claim or suit, provided that Seller agrees to bear all expenses and to satisfy any adverse judgment thereof.

1. If Seller fails to defend such suit or claim after written demand by Buyer, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit or claim.

2. If Buyer fails to provide Seller the opportunity to defend such suit or claim after written demand by Seller, Buyer shall be barred from any remedy against Seller for such suit or claim.

D. If a determination is made that Seller has infringed upon intellectual property rights of another, Seller may obtain the necessary licenses for Buyer's benefit, or replace the Goods and provide related design and construction as necessary to avoid the infringement at Seller's own expense.

*12.03 Buyer's Infringement*

A. Buyer shall indemnify and hold harmless Seller, and its officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement or alleged infringement of any United States or foreign patent or copyright caused by Seller's compliance with Buyer's design of the Goods or Buyer's use of the Goods in combination with other materials or equipment in any process (unless intent of such use was known to Seller and Seller had reason to know such infringement would result).

B. In the event of suit or threat of suit for intellectual property infringement, Seller must within a reasonable time after receiving notice thereof notify Buyer.

C. Upon written demand from Seller, Buyer shall be given the opportunity to defend the claim or suit, including negotiating a settlement. Buyer shall have control over such claim or suit, provided that Buyer agrees to bear all expenses and to satisfy any adverse judgment thereof.

1. If Buyer fails to defend such suit or claim after written demand by Seller, Buyer will be bound in any subsequent suit or claim against Buyer by Seller by any factual determination in the prior suit or claim.

2. If Seller fails to provide Buyer the opportunity to defend such suit or claim after written demand by Buyer, Seller shall be barred from any remedy against Buyer for such suit or claim.

*12.04 Reuse of Documents*

A. Neither Seller nor any other person furnishing any of the Goods or Special Services under a direct or indirect contract with Seller shall: (1) acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions; or (2) reuse any of such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Buyer and Engineer and specific written verification or adaptation by Engineer. This prohibition will survive termination or completion of the Contract. Nothing herein shall preclude Seller from retaining copies of the Contract Documents for record purposes.

## ARTICLE 13 - DISPUTE RESOLUTION

*13.01 Dispute Resolution Method*

A. Disputes between Buyer and Seller will be resolved as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of Paragraphs 9.05 and 9.06, Buyer and Seller may exercise such rights or remedies as they have under Controlling Law.

## ARTICLE 14 - MISCELLANEOUS

*14.01 Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

*14.02 Controlling Law*

A. This Contract is to be governed by the law of the state in which the Point of Destination is located.

*14.03 Computation* of Time

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

*14.04* Cumulative *Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

*14.05 Survival of Obligations*

A. All representations, indemnifications, warranties and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Goods or Special Services and termination or completion of the Agreement.

# SECTION 00 80 50 SUPPLEMENTARY CONDITIONS TO EJCDC PROCUREMENT GENERAL CONDITIONS, P-700 (2000 EDITION)

These Supplementary Conditions amend or supplement the Standard General Conditions for Procurement Contracts No. P-700 (2019 Edition) and other provisions of the Procurement Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

## ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

**Modify Article 1.01A.4 to read:**

4. *Bid*--See Proposal

**Modify Article 1.01A.5 to read:**

5. *Bidder*--See Proposer

**Modify Article 1.01A.29 to read:**

29. *Seller*--The person, firm, or corporation with whom Buyer has entered into the Procurement Agreement to furnish Goods and Special Services.

**Add new articles at the end of Article 1.01:**

"36. *Substantial Completion*--The time at which the Work progresses to the point where, in the opinion of Engineer, the Work is sufficiently complete, in accordance with the Contract Documents, so that the Work can be safely and conveniently utilized for the purpose for which it is intended.
The Work will be considered Substantially Complete after successful completion of the demonstration period.

37. *Construction Contractor*-- The person, firm or corporation with whom the Buyer will enter into a Contract for the general construction of and the installation of the Seller's equipment."

38. *Backwash*--The periodic reversal of flow through a filter which may be accompanied by water in conjunction with air or oxidants at a low concentration (less than 10 mg/L of total chlorine) generally associated with the intermittent waste stream from an ultrafiltration or microfiltration membrane system used to remove particulate matter.

39. *Calendar Day*--See Day

40. *Chemical Washing*--The periodic application of a concentrated chemical solution at high concentration (i.e. more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10 or a surfactant or enzymatic cleaning agent) to a membrane for a short duration of time (twice per day maximum for a total duration of less than 60 minutes) for the intended purpose of maintaining membrane permeability or reducing membrane fouling by a factor of less than 33 percent of the total amount of fouling that may be observed by the membrane

41. *Buyer*—City of Sandy.

42. *Clean In Place*--The periodic application of a concentrated chemical solution at high concentration (i.e., more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10, or a surfactant or enzymatic cleaning agent) a membrane for an extended duration of time (more than 60 minutes per day) for the intended purpose of reducing membrane fouling by a factor of more than 33 percent of the total amount of fouling that may be observed by the membrane.

43. *Contractor*--See Construction Contractor.

44. *Contract Year*--A period of 365 calendar days or 366 days every 4th year beginning with year 2000.

45. *Component Equipment*--describes any item of equipment that is designed and fabricated or manufactured by others but incorporated by and supplied by the Seller in fulfillment of the Contract.

46. *Defective*--See Non-Conforming

47. *Drawing Clarification / Plan Clarification*--An answer from the Buyer or Engineer, in response to an inquiry from the Seller, intended to make the requirement(s) of the drawings or plans clearly understood. Drawing clarifications or plan clarifications may be sketches, drawings or in narrative form and will not change any requirements of the drawings or plans. Responses to the Seller's inquiries shall be as outlined in Section 9.2 of these Procurement General Conditions.

48. *Final Acceptance*--Refers to such time as the Seller has fulfilled all its obligations, other than warranties and guarantees, under the Contract Documents.

49. *MF*--Membrane Filtration.

50. *MSS*—Membrane System Supplier, see Seller.

51. *Module*--A grouping of hollow fiber membranes that are secured into a common potting compound.

52. *Notice of Acceptability*--The written notice issued by the Engineer that the Seller has furnished all Goods and Special Services, and delivered all maintenance and operating instructions, schedules, guarantees, certificates of inspection, and other documents as required by the Contract Documents.

53. *Notice to Commence Fabrication*--A written notice given by Buyer to Seller fixing the date(s) on which the Contract Times for the production and delivery of Goods commence to run and on which Seller shall start to perform under the applicable portion of the Contract.

54. *Notice of Completed Commissioning*--The written notice issued by the Engineer indicating that the Seller has completed the commissioning of the membrane system. The notice shall indicate that the Engineer has reviewed the status of membrane system commissioning to its satisfaction, identified items to be corrected, and that those items that require correction by the Seller have been successfully completed as to allow training of the Buyer's Operational and Maintenance Personnel to commence.

55. *Notice of Completed Installation*--The written notice issued by the Engineer that the Seller has reviewed the installation of the Goods and identified all item to be corrected ant that those items that require correction by the Contractor have been completed as to allow Commissioning of the membrane system to commence.

56. *Notice of Completed Training*--The written notice issued by the Engineer that the Seller has completed training of the Buyer's as a prerequisite to Acceptance Testing of the membrane system.

57. *Notice of Substantial Completion*--The written notice issued by the Engineer to the Seller that Acceptance Testing has been successfully completed.

58. *Phase*--Separate portions of the Project, each of which is subject to Buyer

obtaining funds before Seller is authorized to proceed.

59. *Proposer*--Any person, firm, or corporation submitting a Proposal for providing the Goods and Special Services.

60. *Proposal*--The offer or proposal of the Proposer submitted on the prescribed form setting forth the price(s) for furnishing the Goods and Special Services:

61. *Proposal Documents*--Request for Proposals or advertisement, if any, Procurement Instructions to Proposers, other Proposal information and requirements, Proposal forms and attachments, contract and Bond forms, and the proposed Contract Documents, including any Addenda issued prior to receipt of Proposals.

62. *Proposers Equipment*--describes equipment that has been designed by, manufactured by or fabricated specifically for and supplied by the Seller in fulfillment of the contract.

63. *Special Engineering Services*--The preparation and delivery of shop drawings and other submittals required by the Buyer.

64. *Submittal*--Any documentation specifically prepared by or for the Seller and provided to the Buyer to illustrate fulfill with the requirements of the Contract. Examples of submittals include but are not limited to Applications for Payment, Bonds, Change Orders, Certificates, Manuals, Samples, Shop Drawings, and Schedules.

65. *Successful Proposer*--The Proposer Submitting a responsive Proposal to whom the Buyer makes an award.

66. *System*--Hollow fiber membrane filtration system equipment. The System is comprised Units and ancillary equipment.

67. *Unit(s)*-- A Unit is an assembly of equipment that includes piping, valves, instrumentation, controls, ancillary equipment, appurtenances, support systems, and filtration modules required to treat the raw water.

68. *Train*--A grouping of membrane filtration units that share common ancillary equipment.

69. *Work*--A general description for providing Goods and Special Services as required by the Contract Documents.

70. *Working Days*--is used to describe traditionally accepted business workdays of Monday through Friday inclusive, exclusive of any official organizational or official government holidays for the applicable organization."

**ARTICLE 2 - PRELIMINARY MATTERS**

**Add the following to Article 2.01:**

"B. The Seller shall deliver the required Bonds and Insurance certificates in accordance with Article 4 of the General Conditions.

1. At the time of the effective date of the Agreement, a Performance Bond shall be provided for the Special Engineering Services and Pilot Testing for the amount of $175,000 dollars.

2. Another Performance Bond and a Payment Bond for the remaining portion of the Contract Price shall be provided upon issuance of the "Notice to Commence Fabrication." The Performance Bond shall provide coverage for the performance of the Seller under this Contract until expiration and exclude any continuing obligations of the Seller under this control until expiration and

exclude any continuing obligations of the Suppler, including, but not limited to, the Seller's Membrane System Equipment and Module and Warranty, or other warranties that survive the completion of the Contract."

**Delete Article 2.03 in its entirety and replace with the following:**

"2.03 Commencement of Contract Times

A. The Contract Times will commence to run on the Effective Date of the Agreement."

**Delete Article 2.07 in its entirety and replace with the following:**

"2.07 Within 14 days after the Contract Times start to run, a conference attended by Seller, Buyer, Engineer and others as appropriate will be held in Sandy, OR to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedule referred to in Article 5 of Section 500, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records."

**ARTICLE 3 - CONTRACT DOCUMENTS: INTENT AND AMENDING**

**Add three new articles at the end of Article 3.02:**

"C. The Specifications may vary in form, format and style. Some specification sections are written in varying degrees of streamlined or declarative style and some sections may be relatively narrative by comparison. Omissions of such words and phrases as "the Seller shall," "in conformity with," "as shown," or "as specified" are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the section. The Seller shall not take advantage of any variation of form, format or style in making claims for extra Work.

D The cross referencing of specification sections under the subarticle heading "Related Sections include but are not necessarily limited to:" and elsewhere within each specification section is provided as an aid and convenience to the Seller. The Seller shall not rely on the cross referencing provided as a complete listing of all specifications sections that may impact the Work of a particular specification section. The Seller shall be responsible to coordinate the entire work under the Procurement Documents and provide a complete Project whether or not the cross referencing is provided in each section or whether or not the cross referencing is complete or correct.

E It is the intent of the Procurement Documents that the equipment be compatible and coordinated to produce a fully integrated and operational system. It is the responsibility of the Seller furnishing any one item of equipment, or all equipment included in the Procurement Documents, to assure complete compatibility and coordination of the equipment they are furnishing.

F OSHA Requirements – All work under this Contract shall be performed in accordance with all applicable safety codes, ordinances and other regulations. Particular emphasis shall be given to the applicable regulations of the State of Oregon promulgated pursuant thereto. For purposes of this Contract neither the Buyer, nor the Engineer, nor their respective officers, employees, consultants and inspectors are to be considered experts in safety, and all safety will be the responsibility of the Seller. The Seller shall review its work for compliance with applicable safety requirements and notify the Buyer and the Engineer if there are specific requirements of the Goods that require modifications to the plans and specifications to address safety considerations of the Seller's Goods. This responsibility shall include public safety as well as workers' safety.

G Seller shall comply with the applicable State of Oregon Administrative Rules."

**Add Article 3.04B.1 as follows:**

"1. RFI form attached to this section is the proper instrument to be used for Engineer's written interpretations or clarifications to the contract documents."

**ARTICLE 4 - BONDS AND INSURANCE**

**Delete Article 4.01A in its entirety and replace with the following:**

*"4.01 Bonds*

A. Seller shall furnish performance and payment bonds, each in an amount equal to the Contract Price, to Buyer. The bonds shall be delivered in accordance with Article 2.1 and shall remain in effect one year after the date final payment is due to Construction Contractor, except as provided otherwise by Laws or Regulations."

**Delete Article 4.02 in its entirety and replace with the following:**

*"4.02 Insurance*

A. Seller shall provide insurance of the types and coverages and in the amounts stipulated in the Section 00 83 17, Insurance Specifications for Seller. Seller shall, for the protection and benefit of the Buyer, procure, pay for and maintain in full force and effect, at all times during the performance of the on-site portion of the Work until final payment of the Work or for such duration as required, policies of insurance set forth in this Article, in form and substance acceptable to Buyer. Seller hereby agrees to deliver to Buyer, at least ten (10) days prior to any equipment or personnel being brought onto the site of the Work or the Project site, Certificates of Insurance in form and substance satisfactory to Buyer evidencing the required coverage below:

1. General Requirements. The insurance required to be purchased and maintained by Seller shall be as follows:

a. Include at a minimum the specific coverages and be written for not less than the limits of liability specified herein or required by laws or regulations, whichever is greater. Coverage requirements can be met with any combination of primary and excess limits.

b. Include products/completed operations coverage, which must extend for lawsuits brought in the United States to any product manufactured in the United States and shipped to any foreign country.

c. Include contractual liability insurance covering Seller's indemnity obligations.

d. Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least thirty (30) days prior written notice has been given to the Indemnified Parties.

2. Buyer, Engineer, and their officers, directors, shareholders, partners, employees, agents, consultants and sub-contractors.

a. Remain in effect at least until final payment and at all times thereafter when Seller may be correcting, removing, or replacing defective Work. Evidence of coverage must be provided through term of project.

b. With respect to completed operations insurance, and any other

insurance coverage written on a claims-made basis, remain in effect for at least two (2) years after final payment (and Seller shall furnish the Indemnified Parties evidence satisfactory to the Indemnified Parties of continuation of such insurance at final payment and one 1 year thereafter).

c. Contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance.

d. With respect to workers' compensation and employers' liability, comprehensive automobile liability, commercial general liability, and umbrella liability and, if applicable, transportation insurance, Seller shall require its insurance carriers to waive all rights of subrogation against the Indemnified Parties.

e. Comply with all applicable insurance laws of the country in which the Work is to be performed, including but not limited to, admitted and compulsory coverage.

3 Commercial General Liability Insurance (use ISO Commercial General Liability Policy Form 2002 Edition or equivalent). This insurance shall be occurrence type written in comprehensive form and shall protect the Seller, and the Indemnified Parties as additional insured, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include personal injury liability coverage, contractual liability coverage, completed operations and products liability coverage, and contain a per project aggregate endorsement. Seller's policy must be primary, with no contribution from Buyer coverage. Sellers insurance carrier must waive subrogation against Buyer.

4. Workers' Compensation and Employers' Liability Insurance. This insurance shall protect Seller against all claims under applicable state workers' compensation laws, including coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. Seller shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This policy shall include an "all states" or "other states" provision whether or not required by law (includes sole proprietors and partners). Seller's insurance carrier shall waive subrogation against Buyer. If leased workers are used, an Alternate Employer Endorsement shall be added to the U.S. Government extension endorsements as appropriate (U.S.L. & H., etc.).

5. Comprehensive Automobile Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect Seller and the Indemnified Parties as additional insureds, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the project Site whether they are owned, non-owned, or hired. Seller's insurance carrier must waive subrogation against Buyer.

6. Umbrella Liability Insurance. This insurance shall protect the Seller and the Indemnified Parties as additional insureds, against claims in excess of the limits provided under workers' compensation and employers' liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall at least follow the form of the primary insurance.

7. Equipment Insurance. Seller shall provide and maintain insurance or shall self- insure, against loss or damage to all property, whether owned or

leased by Seller, which is utilized by Seller to perform the Work and which is not permanently incorporated in the Facility, including without limitation, tools, construction equipment, protective fencing, scaffolding, and temporary structures. Seller waives any claim against the Indemnified Parties for loss or damage to such property. Seller shall include a similar requirement in its subcontracts or lower-tier purchase orders, and shall require its lower-tier Seller(s) to provide such a claim waiver for the benefit of Seller and the Indemnified Parties.

8. Seller expressly agrees that Buyer is authorized to withhold payments to Seller until Buyer receives evidence of insurance as required herein. In the event that a claim is presented against the Additional Insured Parties, and there is no insurance provided by Seller or the carrier providing such insurance disclaims or denies coverage, any such claims, loss, cost, expense, liability, damage or injury arise or are made, asserted or threatened against the Additional Insured Parties, and each of them, shall give Buyer the right to withhold from any payments due or to become due to Seller any amount the Buyer deems sufficient to protect and indemnify the Additional Insureds and each of them, from and against any and all such claims, loss cost, expense, liability, damage or injury, including legal fees and disbursements. Buyer, in its discretion, may require Seller to furnish a surety bond satisfactory to Buyer guaranteeing such protection, which bond shall be furnished by Seller within fourteen (14) calendar days after written demand has been made therefore.

9. Seller shall make this Article and these insurance requirements binding on all of its lower-tier Sellers, including, but not limited to, the duty to name the Additional Insured Parties as additional insured on the lower-tier Seller(s) insurance policy(ies) on a primary and non-contributory basis.

10. Professional Liability Insurance. In the event that any of the Work requires professional services by the Seller or its lower-tier Sellers, evidence of professional liability is required. The liability limits shall be not less than:

$1,000,000 each occurrence $1,000,000 general aggregate

11. Transportation Insurance. This insurance shall be of the "all risks" type and shall protect the Seller and the Buyer from all insurable risks of physical loss or damage to equipment and materials in transit to the Jobsite including, but not limited to, transit outside the United States via navigable waters, rail or truck and until the Buyer receives the equipment and materials at the Jobsite. The coverage amount shall be not less than the full amount of equipment and materials shipped. Transportation insurance shall provide for losses to be payable to the Seller and the Buyer as their interests may appear.

12. Include the following additional insureds in Articles 4.2 B.2., 3., 4., and 5. above.

City of Sandy
Stantec Consulting Services, Inc.

**ARTICLE 5 - SELLERS RESPONSIBILITIES**

**Modify Article 5.06A to read:**

"A. Replace wording "review and approval" in all Articles of 5.6 A of the General Conditions with 'review for compliance'."

**Add two new Articles after Article 5.06A that read:**

"1. Shop Drawings submitted as herein provided by Seller and reviewed by Engineer for conformance with the design concepts shall be executed in conformity with the Contract Documents unless otherwise required by Buyer.

2. When Shop Drawings are submitted of the purpose of showing the installation in greater detail, their review shall not excuse Seller from requirements included in the Contract Documents."

**Modify Article 5.06B:**

B. Insert "and issuance of a "Notice to Commence Fabrication" after "submittal."

**Add two new Articles after 5.06C.4. that read:**

"5. See Section 01340.

6. Shop Drawings and Sample submittals not conforming to requirements of this Article 5.6 and Section 01340 will be returned to Seller without action for resubmittal and the resulting delay shall be entirely the responsibility of Seller."

**Modify Article 5.06C. 6.:**

6. Shop Drawings and Sample submittals not conforming to requirements of this Paragraph 5.06 and Section 01 33 03, Submittals for Membrane Procurement Contracts, will be returned to Seller without action for resubmittal.

**Add new Article after 5.06D.2. that read:**

"3. Engineer's check and review of Shop Drawings and Samples, Standard Specifications and descriptive literature submitted by Seller will be only for general conformance with design concept, except as otherwise provided, and shall not be construed as:

a. permitting any departure from the Contract Requirements;

b. relieving Seller of the responsibility for any error in details dimensions or otherwise that may exist in such submittals;

c. constituting a blanket approval of dimensions, quantities, or details of the material or equipment shown; or

d. approving departures from additional details or instructions previously furnished by Engineer. Such check or review shall not relieve Seller of the full responsibility of meeting all of the requirements of the Contract Document."

**Add new Article after 5.06E.1. that reads:**

"2. Engineer will review an initial shop drawing submittal and one resubmittal for any particular item requiring a shop drawing. Items requiring more than two reviews the additional review time will be at the sole expense of the Seller. Engineer will log his time and expenses which will be used by the Buyer to calculate the cost of a deductive change order for the additional review time. Buyer will deduct these costs from the amounts due Seller on the next application for payment.

**Modify Article 5.06E. 2.:**

2. Engineer will review an initial shop drawing submittal and one resubmittal for any particular item requiring a shop drawing. Items requiring more than two reviews the additional review time will be at the sole expense of the Seller and shall not exceed, in the aggregate, $2,500.00. Engineer will log his time and expenses which will be used by the Buyer to calculate the cost of a deductive change order for the additional review time. Buyer will deduct these costs from the amounts due Seller on the next application for payment.

**Delete Article 5.08B in its entirety and replace with the following:**

"B. Seller warrants the guarantees to Buyer that all Goods and Special Services will materially conform with the Contract Documents, including any Samples approved by Engineer, and the Goods will be free from defects in material and workmanship. Engineer shall be entitled to rely on representation of Seller's warranty and guarantee."

**Add new item 3 under Article 5.08C:**

"3. for Membrane Modules, the provision of Section 01 74 00, Membrane

System and Module Warranty."

**Delete Article 5.08E in its entirety and replace with the following:**

"E. Buyer shall within warranty period, notify Seller of any breach of Seller's warranties or guarantees. If Seller provides such written notice within the Warranty Period, Seller shall, at its sole option and as Buyer's sole remedy, repair or replace the parts or equipment that are the subject of the claimed breach or refund the purchase price therefore, if Seller determines that any claimed breach is not covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. If Buyer receives notice of a suit or claim. If Seller fails to defend such suit or claim, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit. The warranties contained herein are conditioned upon the Buyer not being in material default of any obligation to Seller."

**Add Articles after 5.08E:**

"F. The Seller shall submit to the Buyer all Membrane warranty and guarantees documentation.

G. The Seller's warrants and guarantees to the Buyer include the concept of linear scalability as described in Article 7 of the Agreement, Article 8 of the General Conditions, Section 01 74 00, Membrane System and Module Warranty and elsewhere in the Contract Documents.

H. The provisions of the Seller's Membrane Module Warranty, including provisions fur membrane module replacement pricing, shall remain in effect as a continuing obligation.

I. All product warranties and performance guarantees shall only be enforceable if (a) all equipment is properly installed, inspected regularly and is in good working order, (b) all operations are consistent with Seller recommendations, (c) operating conditions at the Site have not materially changed and remain within anticipated specifications, and (d) no reasonably unforeseeable circumstances exist or arise."

**Delete Article 5.09A and replace with the following:**

"A. Seller shall indemnify and hold harmless Buyer, Engineer, and their officers, directors, shareholders, partners, employees, agents, consultants, contractors and subcontractors from any and all claims, costs, losses, and demands or judgments for damages or claims (including but not limited to fees and charges of Engineers, Architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs), to the extent (i) caused by the negligent act or omission of Seller, or its officers, directors, shareholders, partners, employees, agents, consultants, contractors or subcontractors, or anyone for whom the Seller is responsible and (ii) any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death or damage to Buyer's property (other than the Goods and Special Services themselves)."

**Add new Articles following 5.09:**

*"5.10 Access to Goods in Production*

A. The Seller shall provide representatives of the Buyer, testing agencies, and governmental agencies with jurisdictional interests proper and safe access to Goods in the process of production at reasonable times as is necessary for the performance of their functions in connection with the Contract Documents.

*5.11 Confidentiality of Documents:*

A. Subject to regulations governing Public Records in Oregon, all Special Services performed by the Seller, including but not limited to all drafts, data, correspondence, proposals, reports, and estimates compiled or composed by the Seller, pursuant to the Agreement, are for the sole use of the Buyer, its agents and employees. Neither the documents nor their contents shall be released to any third party without the prior written consent of the Buyer. This provision does not apply to information that (a) was publicly known, or otherwise known to the Seller, at the time that it was disclosed to the Seller by the Buyer, (b) subsequently becomes publicly known through no act or omission by the Seller, or (c) otherwise becomes known to the Seller other than through disclosure by the Buyer. Neither the documents nor their contents shall be released to any third party without the prior Written consent of the Buyer.

*5.12 Industry Standards:*

A. The Seller agrees that the Special Services rendered under this Agreement shall be performed in accordance with the standards customarily adhered to by an experienced and competent professional membrane filtration equipment supply firm using the degree of care and skill exercised by reputable professionals practicing in the same field of service. Where approval by the Buyer, the Engineer, or other representatives of the Buyer is required, it is understood to be general approval only and does not relieve the Seller of responsibility for complying with all applicable laws, codes, and good engineering practices.

*5.13 Maintenance of Records:*

A. The Seller shall maintain books, records, logs, documents and other evidence sufficient to record all actions taken with respect to the providing of Goods and Special Services, throughout the performance of the Agreement and for a period of ten years following completion of the obligations under the Agreement. The Seller further agrees to allow the Buyer to inspect, copy, and audit such books, records, documents and other evidence at all reasonable times. Upon request, the Seller agrees to provide the Buyer with backup copies for all electronic documents generated by the Seller in performing under the terms of this Agreement or to provide the Buyer with proof of insurance coverage for valuable papers and records. The Seller shall make available all requested data and records during normal business hours. Failure to make requested records available for audit by the date requested will result in the immediate termination of the Agreement.

*5.14 Cleaning*

A. The Seller, while on the Buyer's site, shall on a daily basis remove dirt, debris, waste and rubbish from its own working area and maintain desks, offices and control stations in a professional manner and dispose of used materials in an appropriate manner."

**ARTICLE 6 - SHIPPING AND DELIVERY**

**Delete Article 6.02A in its entirety and replace with the following:**

"A Seller shall deliver the Goods, excluding the membrane modules, F.O.B., the Point of Destination within a delivery window of 28 days after the Contract Times set forth in the Agreement, or other date agreed to by Buyer and Seller.

1. The membrane modules, spare parts and computer equipment (if applicable) shall be retained by the Seller at its location and will be delivered F.O.B. to the Point of Destination during the commissioning of the Goods."

**Delete Articles 6.02C and 6.02D in their entirety and replace with the following:**

"C The Contractor will provide facilities for receipt and unloading of the Goods at the Point of Destination. When the equipment has been received by the Contractor, title shall pass from the Seller to the Contractor. Additional costs arising from delivery

prior to or after the delivery window will be the responsibility of Seller."

**Change Article 6.03A to read:**

"A Risk of loss and insurable interests transfers from Seller to Contractor upon Contractor's receipt of the Goods. The Contractor shall be responsible for the unloading of the Goods and may reject Goods that visually appear to have been damaged during shipment."

**ARTICLE 7 - CHANGES: SCHEDULE AND DELAY**

**Revise Article 7.01B as follows:**

Replace 15 with 10; Replace 45 with 30.

**Add new Article after 7.01C:**

"D. Change Orders prepared by the Engineer covering changes which are required by the Buyer, or because of any request for Change Order of the Seller for a change to the Contract Time or Contract Price, shall be in writing and shall state the dollar amount or establish the method of payment, any adjustment in contract time and when negotiated prices ate involved, shall provide for the Seller's signature indicating acceptance using the form provided.

E. If notice to the surety of any change in the Procurement Agreement is required by the provisions of any Bond, the giving of such notice will be the Seller's responsibility, and the amount of each applicable Bond may be adjusted accordingly."

**Add new Article after 7.03A.3:**

"4. CPR form attached to this section is the instrument to be used to track and document individual changes in contract time or price which will then be used as detailed documentation for a Change Order."

**Revise Article 7.03B as follows:**

Replace 15 with 10.

**Add new Article after 7.03E:**

"F. Change Order Form: The Seller shall use the attached Change Order Form for all Change Orders associated with the Goods and Services. No additions or deletions to this form shall be allowed."

**ARTICLE 8 - BUYER'S RIGHTS**

**Modify Article 8.01A. 2. as follows:**

Insert, "and shall not exceed, in the aggregate, $2,500.00," after "facility".

**Delete Article 8.01A.3 in its entirety and replace with the following:**

"3. Seller shall bear all expenses, for inspections and tests at the Point of Destination, but Seller shall be entitled to reimbursement from Buyer for Seller's expenses for re- inspection or retesting if, on the basis of an initial inspection or testing, the installation of the Goods are determined to be improper or incomplete."

**Modify Article 8.01A.4 as follows:**

Replace 30 with 14.

**Modify Article 8.01C.1 as follows:**

Insert, "for a period of 11 months during the correction period," after "intended".

**Modify Article 8.02A as follows:**

Insert, "or for such times as provided by a warranty provision that remains in effect after final payment as a continuing obligation," after "the expiration of the correction

period,"

**Delete Article 8.02C in its entirety and replace with the following:**

"C Remedying Non-Conforming Goods or Special Services

1. If Buyer notifies Seller in writing that the Goods are non-conforming, the Seller shall modify, repair or replace the Goods to remedy the non-conformance. Seller shall provide within 10 days the proposed remedy and a schedule that shall make the Goods conforming within a reasonable time.

2. If Buyer notifies Seller in writing that any of the Special Services are nonconforming or have delayed the Buyer's Project, the Seller shall promptly provide conforming Special Services acceptable to Buyer subject to the following provisions:

a. The Seller will be assessed Liquidated Damages for the delays in the timely delivery of Special Services until they are determined to be in conformance.

3. If the Seller fails to take action as required by the Buyer or the Engineer to remedy nonconforming Goods, after 15 days written notice to the Seller, the Buyer shall at its option remedy any such deficiency instead of requiring removal or replacement. Buyer acknowledges and agrees that Buyer, by exercising this option, voids any and all warranties for the Goods. Cost for the Buyer's remedy is subject to the provisions of Article 5.8 and Article 8.2E.

4. In an emergency where delay would cause serious risk of loss or damage, the Buyer may take such action as is necessary to avoid such risk of loss or damage without issuing prior notice or waiting for action by the Seller.

5. If the Goods are determined to be non-conforming as part of a warranty notice or claim pursuant to Article 5.8 or the warranty provisions of Section 01740, Membrane System and Module Warranty, the Seller shall be notified in writing that the applicable conditions for breach of contract or breach of warranty exist.

6. Cost of Remedy

a. If the Goods are determined to be non-conforming before the date of the Notice of Substantial Completion, and a remedy is required, the Seller shall pay for all costs of the remedy, including modification, repairs, removal, and replacement of the Goods.

b. If the Goods are determined to be non-conforming as part of a warranty. claim pursuant to Article 5.8, after the date of the Notice of Substantial Completion and prior to the end of the correction period for the Goods, and the Seller's remedy is to modify or repair the Goods.

c. If the Goods are determined to be non-conforming as part of a warranty claim pursuant to Article 5.8, after the date of the Notice of Substantial Completion and the Seller's remedy is the replacement of existing Goods, Goods shall be delivered to the Buyer F.O.B. Point of Destination. Buyer shall provide the labor associated with the removal and replacement of the non-conforming Goods provided by the Seller as a remedy.

d. In the event that the Seller's remedy involves a change to or addition of Seller's equipment, the Seller shall be responsible for all costs as described in Article 8.2.E for the remedy of the non-conforming Goods and to provide Special Services required for the remedy.

**Add new Article after 8.02C. 6.:**

"7. Goods repaired or replaced are not covered by any warranty except to the extent repaired or replaced by Seller, an authorized representative of Seller, or under specific instructions by Seller, in which cases, the Goods will be covered under warranty up to the end of the warranty period applicable to the original Goods."

**Modify Article 8.02E as follows:**

E. Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, re-testing and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods or Special Services or breach of warranties, including the correction or removal and replacement of the nonconforming Goods and the replacement of property of Buyer destroyed by the correction or removal and replacement of the non-conforming Goods, to the proportionate extent caused by Seller's breach of the warranty. In no event shall Seller be liable for any consequential, indirect, incidental, special, exemplary, or punitive damages, lost profits or revenues or diminution in value, including without limitation, remanufacturing costs and rework costs, de-installation, or re-installation costs.

**Add new items under Article 8.02E:**

"1. With respect to breach of contract claim by the Buyer the following provisions apply:

a. In the event that the Seller's membrane filtration system does not satisfy the conditions of linear scalability as described in the Contract Documents, and Seller's remedy is not agreeable to the Buyer, the Buyer shall declare Seller in breach of Contract in accordance with Article 11.4.B.

2. With respect to a breach of warranty claim by the Buyer, the following provisions apply.

a. In the event that the membrane modules are non-conforming due to defects in materials, workmanship, membrane integrity or irreversible flux loss as described in Section 01 74 00, Membrane System and Module Warranty, and the Seller's remedy is not agreeable to the Buyer, the Buyer shall declare a breach of warranty exists.

b. Buyer shall provide Seller with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach of warranty has occurred. Seller shall have ten days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure the alleged breach.

3. If incurred prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents and a commensurate reduction in the Contract Price. If the costs exceed the unpaid balance of the Contract Price, the costs in excess of the Contract Price shall be paid by the Seller to the Buyer. The provisions of this Article shall be in addition to all other rights and remedies available to the Buyer under the Procurement Agreement and any applicable laws."

**Delete Article 8.03 in its entirety and replace with the following:**

*"8.3 Correction Period*

A. Seller's responsibility for correcting all nonconformities in the Goods will extend for a period of one year after the date of the Notice of Substantial Completion, or for such longer period of time as may be prescribed by Laws or Regulations or by the terms of any specific provisions of the Contract Documents."

**ARTICLE 9 - ROLE OF ENGINEER**

**Add after Article 9.04A:**

"B. The acceptance at any time of materials or equipment by or on behalf of Buyer shall not be a bar to future rejection if they are subsequently found to be defective, inferior in quality, or not equal to the material or equipment specified or are not as represented to Engineer or Buyer."

**ARTICLE 10 - PAYMENT**

**Delete Section 10.01 in its entirety and replace with the following:**

*10.01 Applications for Progress Payments*

"A. Seller shall submit Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Contract Documents and also as Buyer or Engineer may reasonably require for review and approval. The timing and amounts of progress payments shall be as stipulated in the Agreement.

1. Applications for Progress Payments for Special Engineering Services

   a. The Seller shall submit Applications for Payment to the Engineer for review, completed and signed by the Seller. The Applications for Payment shall be submitted according to the following schedule:

      1) The first Application for Payment shall be submitted after the Engineer has reviewed and approved all pilot testing and the report.

      2) The second Application for Payment shall be submitted after the Engineer has reviewed and approved all Shop Drawings (Refer to Section 01 34 00, Shop Drawing Procedures; Tables A and B) and all other related submittals as required by the Contract Documents.

2. Applications for Progress Payments for Equipment:

   a. The Seller shall submit Applications for Payment to the Engineer for review, completed and signed by the Seller. The Applications for Payment shall be submitted according to the following schedule:

      1) The first Application for Payment shall be submitted following initial contract award.

      2) The second Application for Payment shall be submitted when the Buyer has issued a "Notice to Commence Fabrication."

      3) The third Application for Payment shall be submitted after the delivery of the Goods in accordance with Article 5 of the Agreement. The Application for Payment will be accompanied by a bill of sale and other documentation satisfactory to the Buyer warranting that the Contractor has received the Goods free and clear of all liens, charges, security interest, and encumbrances. Such documentation shall include releases and waivers from all parties who, during the Seller's execution of its responsibilities under the Contract Documents, might have obtained or

filed any such lien, change, security, or encumbrance.

4) The fourth Application for Payment shall be submitted after the "Notice of Substantial Completion" has been issued by the Engineer.

B. In the event of the Assignment of the Agreement from the Buyer to the Contractor, the payment procedures shall not be altered. The Buyer will provide payment directly to the Seller."

**Delete Article 10.02A.1. in its entirety and replace with the following:**

"1. Engineer's recommendation of payment requested in Applications for Payment for Shop Drawings will constitute a representation by Engineer, based on Engineer's review of the Application for Payment and the accompanying data that the Shop Drawings have been reviewed as required by the Contract Documents and Seller is entitled to payment of the amount recommended."

**Modify Article 10.02 A. 3. as follows:**

3. Engineer may refuse to recommend that all or any part of a progress payment be made, or Engineer may recommend nullifying all or any part of any payment previously recommended if, in Engineer's opinion, such recommendation would be incorrect or if on the basis of subsequently discovered evidence or subsequent inspections or tests Engineer considers such refusal or nullification necessary to protect Buyer from loss because the Contract Price has been reduced, Goods are found to be non-conforming, or Seller has failed to furnish acceptable Special Services.

**Modify Article 10.03A. as follows:**

A. Subject to Paragraph 10.02.A., the amounts of the progress payments will be as provided in the Agreement. Buyer shall within 30 days after receipt of each invoice from Seller pay the Seller. Buyer shall notify Seller promptly of any deficiency in the documentation and shall not unreasonably withhold payment.

**Modify Article 10.04. as follows:**

Neither party will have any rights to set-off hereunder except to the extent agreed to be an undisputed claim. In any action related to Buyer's election to withhold payments due to Seller, Buyer shall bear the burden of proving default by Seller. and that its election to withhold was justified.

**Delete Article 10.05 and replace with the following:**

*10.05 Final Application for Payment*

"A. After the correction period and following the completion of the Final Inspection as per Article 8.1.C, and after Seller has corrected all non-conformities to the satisfaction of Buyer and Engineer, furnished all Special Services, and delivered all documents required by the Contract Documents, Engineer will issue to Buyer and Seller a Notice of Acceptability. Seller may then make application for final payment following the procedure for progress payments. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents, a list of all unsettled claims and such other data and information as Buyer or Engineer may reasonably require."

**ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION**

**Delete Article 11.01A.1 in its entirety and replace with the following:**

"1. Buyer may not cancel this Agreement after Sales Confirmation unless all the details are approved in writing by the parties, including Buyer's agreement to pay a stated amount of termination charges. Unless otherwise agreed to in writing by Seller, the termination charges shall be as follows and, for certainty, such

amounts below shall include Seller's reasonable profit forming part of the Purchase Price based upon the percentages set forth.

| Termination Charge | Milestone |
|---|---|
| 0% of the Purchase Price | After Sales Confirmation but prior to release to purchase materials |
| 25% of the Purchase Price | After release to purchase materials but prior to release for fabrication |
| 75% of the Purchase Price | After release for fabrication but prior to Equipment Completion |
| 95% of the Purchase Price | After Equipment Completion but prior to release for shipment |
| 100% of the Purchase Price | After release for shipment |

2. The Seller shall be entitled to a reasonable allowance for overhead and profit with respect to all work on the Project completed in accordance with the Contract Documents prior to cancellation by the Buyer pursuant to this Paragraph 11.01."

**Add the following items after 11.04B.2.b:**

"c. Buyer may terminate for the following reasons, including but not limited to:

1) If the Seller commences a voluntary case under any chapter of the Bankruptcy Code, as now or hereafter in effect, of if the Seller takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to bankruptcy or insolvency

2) If a petition is filed against the Seller: under any chapter of said Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against the Seller under any other federal or state law in effect at the time relating to bankruptcy or insolvency

3) If the Seller makes a general assignment for the benefit of creditors

4) If a trustee, receiver, custodian, or agent of the Seller is appointed under applicable law, or under contract, whose appointment or authority to take charge of property of the Seller is for the purpose of enforcing a lien against such property or for the purpose of general administration of such property for the benefit of the Seller's creditors

5) If the Seller admits in writing an inability to pay its debts generally as they become due; or

6) If the Seller breaches the Procurement Agreement or any provision of the Contract Documents and such breach continues for a period of 15 days after written notice to correct the breach from the Buyer to the Seller

7) Fails to provide competent management and supervision, competent staff or materials or equipment meeting the requirements of the Procurement Agreement

8) Disregards laws or regulations of any public body having jurisdiction

9) Commits serious violations of approved or legislated safety requirements

10) Has assigned any part of the obligations under the Procurement Agreement without the Buyer's prior written consent

**ARTICLE 12 - LICENSES AND FEES**

**Add after Article 12.01B:**

"C. Seller grants Buyer a non-exclusive royalty free license to use any process or apparatus claimed in any patent owned by Seller but only to the extent that this license is required by Buyer to build and operate the Project described in this contract using membranes supplied by Seller. All other rights are reserved."

**Modify Article 12.02A. as follows:**

A. Subject to Paragraph 12.01.A, Seller shall indemnify and hold harmless Buyer, Engineer and their officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) as finally determined by a court of competent jurisdiction in any suit for infringement of any U.S. or Canadian patent (or European patent for Goods that Seller sells to Buyer for end use in a member state of the E.U.) that has issued as of the delivery date, solely by reason of the sale or normal use of any Goods sold to Buyer hereunder and from reasonable expenses incurred by Buyer in defense of such suit if Seller does not undertake the defense thereof, provided that BUYER promptly notifies Seller of such suit and offers Seller either (i) full and exclusive control of the defense of such suit when Goods of Seller only are involved, or (ii) the right to participate in the defense of such suit when products other than those of Seller are also involved. Seller's warranty as to use patents only applies to infringement arising solely out of the inherent operation of the Goods according to their applications as envisioned by Seller's specifications.

**Modify Article 12.02B. as follows:**

Replace "within a reasonable time of receiving notice thereof" with "promptly when receiving notice thereof."

**Delete Article 12.02D and replace with the following:**

"D. If determination is made that Seller has infringed upon intellectual property rights of another, Seller may, at its election, and as Buyer's sole and exclusive remedy under this indemnification provision, (i) obtain the necessary licenses for Buyer's benefit, or (ii) replace the Goods and provide related design and construction as necessary to avoid the infringement at Seller's own expense or, (iii) remove the infringing Goods and refund to the Buyer the purchase price."

**ARTICLE 13 - DISPUTE RESOLUTION**

**Delete Article 13.01 in its entirety and replace with the following:**

*13.1 Dispute Resolution Method*

A. Disputes between the Buyer and Seller will be resolved as set forth in Article 13.3.

*13.2 Mediation – Not Used*

*13.3 Arbitration*

A. All Claims or counterclaims, disputes, or other matters in question between Buyer and Seller arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by Article 10.7) will be decided by binding arbitration in

accordance with the rules of the American Arbitration Association, subject to the limitations of this Article 13.3. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. No demand for arbitration of any Claim or counterclaim, dispute, or other matter that is required to be referred to Engineer initially for decision in accordance with Article 9.5 will be made until the earlier of: (i) the date on which Engineer has rendered a written decision, or (ii) the 31st day after the parties have presented their final evidence to Engineer if a written decision has not been rendered by Engineer before that date. No demand for arbitration of any such Claim or counterclaim, dispute, or other matter will be made later than 30 days after the date on which Engineer has rendered a written decision in respect thereof in accordance with Article 9.6; and the failure to demand arbitration within said 30 day period will result in Engineer's decision being final and binding upon Buyer, and Seller. If Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but will not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

C. Notice of the demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the 30 day period specified in Article 13.3.B, and in all other cases within a reasonable time after the claim or counterclaim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statute of limitations.

D. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and

2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings

E. The award rendered by the arbitrators will be final, judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal."

**Request for Information (RFI)**

**Project:** **City of Sandy** **RFI No:** _____
**Alder Creek Water Treatment Plant Upgrade Project**

**Stantec Project No.:** 2002006267 **Date:** _____

**Owner Project No.** _____ **Contractor Project No.** _____

---

**Request:**

_____ _____ Owner _____ Contractor _____ Stantec
Engineering Signature

---

**Reply:** **Date:**

_____ _____ Owner _____ Contractor _____ Stantec
Engineering Signature

**Contract Change Order Agreement**

**Project:** City of Sandy
Alder Creek Water Treatment Plant Upgrade Project

**Date:** _____

**Change Order No.** _____

**Contractor:** _____

**Stantec Project No.:** 2002006267

**Contractor Project No.** _____

SUMMARY OF PROPOSED CHANGE: _____

| ITEM | QUANTITY | UNIT PRICE | INCREASE OR DECREASE |
|---|---|---|---|
| **A.** | | | |
| **B.** | | | |
| **SUBTOTAL** | | | |
| **FINAL CONTRACT PAYMENT** | | | |

Additional contract time for substantial completion: _____ calendar days.

The Contractor accepts the above adjustment to the contract. By accepting this change, the Contractor agrees that it shall be full payment and final settlement of all claims for contract time and for direct, indirect, and consequential costs, including costs of delays related to any work either covered or affected by the change.

SIGNATURES:

Contractor: _____ Date: _____

Engineer: _____ Date: _____

APPROVED BY: _____ _____ _____
City of Sandy Date Authorized Official

**Change Proposal Request (CPR)**

**Project:** **City of Sandy**
**Alder Creek Water Treatment Plant Upgrade Project**

**CPR Date:** _____

**CPR No.** _____

**Stantec Project No.:** 2002006267

**Date Sent to Contractor:** _____

**Owner Project No.** _____

**Date Received from Contractor:** _____

We hereby request the cost of the following proposed change in your contract on subject project and the return of this completed form. A breakdown of your costs shall be attached. Do not proceed with this work until authorized by Owner.

Description of the proposed change: _____

Proposed by: _____
Title: _____

All work shall be in accordance with the terms, stipulations, and conditions of the original Contract Documents. If the work herein provided is approved by Change Order, the time of completion will be increased by ___ calendar days.

Add: _____
Deduct: _____
Net Changed: _____
Contractor: _____
By: _____
Date: _____

| | |
|---|---|
| Stantec Recommendation: | _____ Approval<br>_____ Non Approval |
| By: _____ | Date: _____ |
| Reason for Non Approval: | _____ |
| | |
| | |

OWNER'S ACTION: _____ ACCEPTED _____ NOT ACCEPTED

BY: _____ Date: _____

COMMENTS: _____

**Certificate of Substantial Completion**

| | |
|---|---|
| Project Name: **Alder Creek Water Treatment Plant Upgrade Project** | Stantec Project No: 2002006267 |
| | |
| Project Owner: City of Sandy | Owner's Project No: |
| Project Contractor: | Date of Contract: |
| This Certificate of Substantial Completion Applies to:<br>D All work under the Contract Documents D The following specific portions: | |
| Date of Substantial Completion: | |

**The work performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion of the project or portion thereof designated above is hereby declared and is also the date of commencement of warranties required by the Contract Documents, except as stated below.**

A list of items to be completed or corrected, is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. The date of commencement of warranties for items on the attached list will be the date of final payment unless otherwise agreed to in writing.

| |
|---|
| The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be provided in the Contract Documents except as amended as follows:<br>D Amended Responsibilities D Not Amended |
| Owner's Responsibilities: |
| |
| |
| |
| Contractor's Responsibilities: |
| |
| |
| |
| The following documents are attached to and made part of this certificate: |
| |
| |

**This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.**

| | |
|---|---|
| Executed by the Engineer | Date: |
| Accepted by the Contractor | Date: |
| Accepted by the Owner | Date: |

END OF SECTION

# SECTION 00 83 17

# INSURANCE SPECIFICATIONS FOR SELLER

## GENERAL LIABILITY

- ISO Commercial General Liability Policy form, current edition.
- $1,000,000 Per Occurrence limit.
- $2,000,000 Products/Completed Operations Aggregate limit.
- $2,000,000 General Aggregate limit.
- Per Project or Job Site Aggregate.
- BUYER, ARCHITECT/ENGINEER and their employees, subsidiaries, subconsultants and assigns must be designated as Additional Insureds for both Ongoing and Completed Operations.
- SELLER's policy must be Primary, with no contribution from BUYER's coverage.
- SELLER's insurance carrier must waive subrogation against BUYER.

## COMMERCIAL AUTO

- $1,000,000 Combined Single Limit of coverage.
- Coverage must be provided for all owned, non-owned, and hired vehicles.
- SELLER's insurance carrier must waive subrogation against BUYER.

## WORKER'S COMPENSATION

- Statutory coverage provided for the state in which operations are undertaken, **whether or not required by law (includes sole proprietors & partners).** Sole proprietors may substitute a minimum premium/zero payroll policy obtainable from their agent.
- Employer's Liability limits of $500,000/$1,000,000/$500,000.
- CONTRACTOR's insurance carrier shall waive subrogation against BUYER.
- If leased workers are used, an Alternate Employer Endorsement shall be added.
- U S Government extension endorsements as appropriate (U.S.L.& H., etc.).

## UMBRELLA OR EXCESS LIABILITY

- $2,000,000 limit minimum.
- Must follow form with all primary policies.

## OTHER

- Insurance carrier(s) providing coverage shall be rated at least A-VII by A. M. Best.
- SELLER shall provide Property Insurance (Builder's Risk) for the project. Property Insurance shall cover all BUYER-supplied materials and equipment.
- SELLER shall be responsible for any Property Insurance deductibles.
- SELLER shall bear all responsibility for loss to owned tools and equipment.
- Certificate of Insurance shall provide for 30 days' prior written notice in cancellation clause.
- Certificate of Insurance must indicate above coverage elements.
- BUYER reserves right to require certified copies of policies and/or endorsements.
- Project Management Protective and Boiler & Machinery coverage is not required.

**END OF SECTION**

# SECTION 01 01 00 SUMMARY OF GOODS AND SPECIAL SERVICES

## PART 1 -- GENERAL

1.1 DESCRIPTION

A. Description of Work

1. The summary of the Goods and Special Services described in this Section is an overall summary of the responsibilities of the Seller and its relation to the Buyer, Engineer, and Contractor. It does not supersede the specific requirements of other Contract Documents.

2. Project Background.

a. The Goods and Special Services consist of designing and furnishing containerized membrane filtration equipment required for the City of Sandy's Alder Creek Water Treatment Plant (WTP). The Goods and Special Services also consist of furnishing manufacturer-trained personnel for the installation, commissioning, acceptance testing, training, and operations assistance as specified.

b. The following narrative is provided as a general description of the project background and goals. Design or operating parameters and proposed improvements beyond those that relate to this project are provided as information based upon the current understanding of the project and shall not constitute the basis of design and/or operation of the current or proposed facilities.

c. The WTP will use Alder Creek as source water. The water system will have a firm capacity of 2.0 MGD. The term 'firm capacity' means that the capacity can be achieved with the largest primary membrane unit out of service. A membrane unit shall consist of a membrane module rack, dedicated feed pump and dedicated strainer.

d. Water will be obtained from Alder Creek using a fixed-level intake. The raw water will be coagulated with polyaluminum chloride (PACL) or aluminum chlorohydrate (ACH), dosed with sodium hydroxide for pH control, and sodium hypochlorite added for oxidation, and will pass through a static mixer. The purpose of coagulation/flocculation is to coagulate and remove natural organic matter (NOM) and color to comply with the regulatory requirements for disinfection byproduct (DBP) control. Coagulated raw water will be stored in the MF Feed Tank outside of the containerized membrane systems and will receive a minimum of two-minute reaction time prior to entering the membrane feed pumps.

e. The raw water will enter the containerized membrane systems under hydrostatic pressure available from the MF Feed Tank. Membrane feed pumps located inside each containerized system, will pump water through automatic backwashable strainers that are designed to remove algae and other deleterious materials.

f. The membrane system will be pressure-type. Water will pass through a unit modulating influent control valve and enter the treatment unit. Water is filtered across the membrane using differential pressure. The filtered water is then discharged.

a) The system will use a periodic Air Scour – Backwash process to remove accumulated contaminants from the membranes. The process utilizes air on the feed side of the membrane with filtered water to scour the membrane fibers. The waste from the process is then discharged to the solids drying beds.

b) The system will be periodically cleaned using a Maintenance Clean (MC) process which is a chemical washing procedure. Citric acid or sodium hypochlorite solution is used to clean the membranes. Once the MC process is complete, the remaining solution in the filtration unit is neutralized, dechlorinated, and flushed to a CIP holding tank.

c) The membrane system will use a Clean-In-Place (CIP) process using a citric acid, sodium hydroxide, or sodium hypochlorite solution. The solution is heated and circulated through the membrane unit and returned to the CIP Tank in each containerized system. Once the cleaning process is complete, the CIP solution is recovered in the CIP Tank and the remaining solution in the filtration unit is neutralized, dechlorinated, and flushed to the CIP holding tank.

g. After the water is filtered, chlorinated for disinfection, pH adjusted, it will be discharged to a chlorine contact tank. The Buyer's high service pump station will pump the potable water into the distribution system for customer's use.

h. Backwash wastewater will discharge to a collection manhole. It will flow to a backwash holding pond.

i. Process residuals from the CIP system will be neutralized, dechlorinated, and discharged to a CIP holding tank in accordance with the requirements of the Buyer.

j. Each membrane filtration system will incorporate a direct integrity test feature to determine that the membranes are integral and not compromised.

1.2 WORK COVERED BY PROCUREMENT DOCUMENTS

A. In general, the Goods and Special Services include:

1. Scope of Supply described in Section 11 30 00, Hollow Fiber Membrane Equipment.

a. Containerized membrane filtration units (excluding interconnecting pipework as shown on the Drawings).

b. Membrane filtrate monitoring system.

c. Process Air Compressor.

d. Blowers for air scour.

e. Feed/Backwash Pumps.

f. Air diaphragm chemical transfer pumps for citric acid, calcium thiosulfate, sodium hydroxide and sodium hypochlorite used in the membrane system cleanings.

g. Strainers

h. Clean-In-Place (CIP) and Neutralization Pumps.

i. Electrical control panels for the MF equipment.

j. Process Logic Controllers (PLCs) for the MF equipment.

k. Human Machine Interface (HMI) for MF and other equipment.

l. Field-mounted instrumentation including:

1) Switches.

2) Gauges.

3) Flowmeters.

4) Pressure indicating transmitters.

5) Turbidity meters.

m. Other analytical instrumentation.

2. Special Engineering Services and Drawings supplied by the Seller shall include, but are not limited to, the following:

a. Design of the Goods provided by the Seller.

b. Submittal of Shop Drawings and Samples.

c. General arrangement drawings of membrane units and of interconnecting piping between membrane filtration treatment trains.

d. General arrangement drawing of Compressed Air/Aeration Equipment.

e. P&ID's for Seller furnished systems and systems denoted to be controlled by Seller's control system.

f. Electrical Drawings of Seller furnished systems.

g. PLC (remote I/O racks) Unit Panel Drawings for Seller furnished equipment.

h. Participate in meetings and assistance to the Buyer, Engineer, and Contractor during the design.

i. Any changes required by the Seller to coordinate the design with the Engineer for the membrane system.

3. Special Services shall include but are not limited to the following:

a. Scheduling of equipment delivery, witnessing unloading and unpacking of Seller supplied equipment, and inspecting/inventorying equipment.

b. Training of Contractor.

c. Operational and Maintenance Manuals for all equipment provided.

d. Oversee the setting of membrane filtration equipment.

e. Review of equipment installation.

f. Calibration of Seller supplied instrumentation.

g. Commissioning of the Goods.

h. Equipment and services for demonstration/performance testing.

i. Acceptance testing.

j. Operator training.

k. Correction period service visits.

l. Membrane Module and System Warranty.

4. Project responsibilities:

a. Provide design support to Engineer.

1) The Seller shall provide the Engineer with design assistance and review of the General Arrangement and detail drawings for the interconnecting piping between membrane units and between the membrane filtration system and support facilities (i.e., raw water supply, clearwell, backwash waste pipeline, cleaning systems, air systems, etc.).

b. Participation in meetings and assistance to the Buyer and the Engineer during the installation, commissioning and acceptance testing of the Goods.

c. Respond to requests for information (RFIs) and provide field support during construction.

d. Shop Drawing, Installation Manual, Operation and Maintenance (O&M) Manual and other miscellaneous submittals. Refer to Section 01 34 00, Shop Drawing Procedures.

e. Attend/participate in Engineering/Progress Meetings during the design, construction, commissioning, and acceptance testing of Seller provided equipment.

f. Any changes required by the Seller for coordination of the design with the Engineer for the membrane system.

g. Design and programming of the PLC and human machine interface (PLC/HMI) system for the WTP and membrane system, including but not limited to:

1) Design and programming of operator interface screens, data logging and reporting system.

2) Coordination between Seller provided PLC and other Buyer provided PLC/SCADA systems.

3) Programming of PLCs and HMIs supplied with each system.

4) Factory acceptance testing of PLC system.

5) Cooperation and coordination with the Engineer on development of the Seller's HMI/SCADA system.

5. The summary of the Good and Special Services described in this section is an overall summary of the responsibilities of the Seller and his relation to the Buyer.

a. It does not supersede the specific requirements of other Procurement Documents.

B. Special Services:

1. Provide authorized representatives of the Seller, factory trained and experienced in the technical applications, installation, operation and maintenance of Goods to perform each of the Special Services required.

a. Sales representatives or agents of the Seller will not be accepted.

b. The only exception to this is that Seller's sales representative may represent Seller during delivery of Goods.

2. Representatives are subject to acceptance by Engineer.

3. Once assigned, no substitute representatives will be allowed unless prior written approval by Engineer has been given.

4. Where specific time is allocated for a particular Special Service, the time expended shall be documented by the Seller and Buyer at the time the Special Service is provided.

a. Provide documentation to the Buyer on a monthly basis.

1) Documented hours shall be reconciled by the Buyer and Seller on a monthly basis.

b. At the conclusion of the Special Service, additional hours provided at the request of the Buyer or hours specified but not used shall be agreed to between the Seller and the Buyer.

1) Based on the per diem rate provided in the Proposal, the contract amount will be adjusted.

5. Seller to provide one representative selected to be the most qualified to represent the Seller for the individual Special Service provided.

a. The use of multiple representatives for any particular Special Service shall have prior approval by the Engineer.

C. Chronological Overview of Special Services and Meetings:

1. Project Kick-Off Meeting:

a. Review project requirements, introduce team members and establish communication protocol.

b. Seller to include four (4) hours for one (1) virtual MS Teams meeting.

2. Coordination Meeting (P&ID Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the P&ID Shop Drawing Submittal.

b. Attend virtual MS Teams meeting after Engineer review of P&ID Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

3. Coordination Meeting (Single Line Piping Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the Single Line Piping Shop Drawing Submittal.

b. Attend virtual MS Teams review meeting after Engineer review of Single Line Piping Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

4. Coordination Meeting (Equipment Data Technical Cut Sheet Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the Equipment Shop Drawing Submittal.

b. Attend virtual MS Teams review meeting after Engineer review of Equipment Data Technical Cut Sheet Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

5. Coordination Meeting (Electrical Power, Instrumentation Power and Control Wiring, and electrical equipment data technical cut sheets Shop Drawing Submittal Review Meeting):

a. Review and resolve Engineer review comments provided for the Electrical Power, Instrumentation Power and Control Wiring Drawing and electrical equipment data technical cut sheet Shop Drawing Submittal.

b. Attend virtual MS Teams review meeting after Engineer review of Electrical Power, Instrumentation Power and Control Wiring, and electrical equipment data technical cut sheets Shop Drawing Submittal.

c. Seller to include cost of one (1) eight (8) hour day for one (1) meeting.

6. Final Facility Design Integration:

a. Provide information and assistance to the Buyer and Engineer to coordinate and integrate Goods provided by Seller with the remaining interrelated systems designed by the Engineer.

b. Attend three (3) separate virtual MS Teams meetings with the Buyer and Engineer for integration of Goods into facility design.

c. Seller to include cost of one (1) eight (8) hour day for each meeting.

d. Integration shall include review by the Seller of the membrane tank(s) and/or skids(s) and pump orientations to confirm layout protects the membranes from excessive hydraulic forces that could damage the membranes or impact warranty.

e. Integration shall include review by the Seller of the membrane inlet channel/piping configuration to confirm the Seller's feed water conditions to the membrane equipment are met under all standard operating scenarios.

f. Initial meeting will be tentatively scheduled two (2) weeks following project kickoff coordination meeting.

1) The second meeting will be scheduled at the initial meeting.

2) The third meeting will be scheduled at the second meeting.

7. Receipt of Goods:

a. Verify and document that Goods are properly delivered and unloaded and that storage requirements are clearly communicated to the Contractor.

b. Provide construction site representation during delivery of Goods including all partial shipments.

c. Seller to include in the bid all the costs associated with delivery of Goods to the project site.

1) Buyer will not be responsible for additional costs associated with partial shipments or delivery of goods.

8. Pre-Demonstration Period:

a. Assist Contractor with supervision of the installation of Goods.

1) Coordinate services with Contractor's overall construction schedule.

a) Assume five (5) four (4) day trips (32 hours on site each trip) for supervision assistance along with all time required for travel to and from the site as well as expenses.

b) Be present to supervise the assembly and/or installation of:

(1) Membrane Tank(s) including chemical storage and neutralization, backwash storage, and membrane tanks and/or skids.

(2) Membrane blowers, air compressors and pumps and/or pump skids.

(3) Process control valves external to the membrane tanks or skids.

(4) Process control valves and piping internal to the membrane tanks or skids that are not pre-piped and/or factory installed.

(5) Control panels and/or valve panels.

(6) Membrane racks.

b. Equipment Startup and Training:

1) Provide startup and operator training services for Seller provided equipment.

2) Cost of these services is included in Seller's bid price for supplying Goods.

a) Duration of this phase is dependent on the quality of the Seller's equipment and programming.

b) Seller to assume no more than one (1) piece of equipment can be started in one (1) eight (8) hour day with one (1) training session for operation and maintenance personnel in said eight (8) hour day.

3) Seller may utilize representatives from air compressor, blower, pump, and other bought out equipment for installation assistance of Seller's purchased equipment.

a) Seller remains responsible for coordination and quality of Special Services if such representatives are used.

4) Training

a) Assist Contractor in training Buyer's personnel on the operation and maintenance of Goods.

9. Functional Demonstration:

a. Assist Contractor in demonstrating the functional integrity of the mechanical, electrical and control systems related to the Goods.

b. Cost associated with this phase of the work is included in the Seller's price of the Goods.

c. Duration of this phase is dependent on the quality of the Seller's equipment and programming.

10. Performance Demonstration:

a. Demonstrate and document that the Goods provided meet the operational criteria specified and, if performance does not meet specified criteria, provide corrective action to meet those criteria.

b. Duration of this phase is dependent on the quality of the Seller's equipment and programming.

11. Acceptance Testing:

a. Demonstrate the Goods supplied meet the minimum performance requirements of the contract.

b. Duration of this phase is dependent on the quality of the Seller's equipment.

12. Operations Assistance:

a. Provide operational assistance to the Buyer over the period of one (1) year.

b. Assume three (3), two (2) day trips (16 hours on site each trip) for operational assistance along with all time required for travel to and from the site as well as expenses.

c. Participate in a two (2) day on-site warranty inspection at the end of the correction period.

D. The WORK is located near Boardman Oregon as described in Division 00.

1.3 WORK BY OTHERS

A. Individual Party Responsibilities:

1. Engineer's Responsibilities:

a. Facility Design:

1) Overall facility design.

2) Design/specification of yard piping (raw, potable, residuals).

3) Design/specification of Raw Water Supply Piping/Valves up to containerized membrane systems.

4) Design/specification of filtered water piping/valves from containerized membrane System Buyer's chlorine contact tank.

5) Design/specification of the bulk chemical feed facilities (e.g., caustic soda, sodium hypochlorite, aluminum chlorohydrate).

6) Design/specification of the Recovery/Maintenance clean interconnecting piping.

7) Design/specification of chlorination facilities.

8) Design/specification of service water pumps.

9) Design/specification of electrical motor control centers (MCCs) and conduit schedules.

10) Design/specification Structural Elements of Facility, including awning that containerized units will be placed under..

11) Preparation of bidding documents for Contractor.

12) Design/specification of waste washwater handling facilities.

b. Project Responsibility:

1) Review and approval of shop drawing submittals.

2) Review of Applications for Payment.

3) Review of Applicable Building Codes.

4) Assist Buyer to obtain required permits.

5) Observation during installation and acceptance testing.

2. Contractor's Responsibilities:

a. Constructing the treatment facility, including any lifting/moving equipment associated with the building structure.

b. Receiving, unloading, and storing of all equipment at the project site.

c. Installation of all Containerized Membrane Filtration Equipment and other equipment provided by Seller.

d. Submittal, purchase, and installation of equipment specified by the Engineer and denoted on the Drawings.

e. Installation of all yard piping.

f. Installation of interconnecting piping between Containerized Membrane Filtration Units.

g. Installation of electrical systems and operator interfaces.

h. Corrective assistance during equipment commissioning.

i. Administer Seller's Contract, if assigned by the Buyer.

j. Other work as identified in the Contract Documents.

3. Buyer's Responsibilities:

a. Provide operator(s) for training.

b. Obtain permits as required.

c. Operation of the treatment facilities in accordance with Seller's recommendations.

d. Payment to contracted parties.

e. Timely responses to RFIs and design decisions.

f. Provide meeting locations and attend meetings.

g. Provide any applicable Buyer standards.

h. General oversight of Contractor.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 08 00 IDENTIFICATION AND TAGGING

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. Provide for each piece of tagged equipment supplied, provide a noncorrosive identification tag firmly attached and permanently engraved with the tag number.

2. The equipment number used by the manufacturer shall be consistent with the number used to identify the equipment in parts listings and other O&M documentation. The Seller's proposed tagging scheme shall be consistent with paragraph 2.2 and will be submitted to the Engineer per Section 01 34 00, Shop Drawing Procedures. Where possible, equipment tags shall be affixed to the equipment by the equipment manufacturer prior to delivery to the Contractor.

3. The Seller shall be responsible for providing all identification tags for equipment provided loose for installation by the Contractor.

4. For all tagged devices supplied, the Seller shall develop an "Equipment Cross Reference Schedule" that matches the tag to the equipment. Separate Schedules shall be provided for Equipment, Instruments, Valves, Motors, and Input/Output (I/O) Control Loops. The schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range and other pertinent information. The Equipment Cross-Reference Schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

B. Reference Specifications

1. Section 01 34 00, Shop Drawing Procedures

2. Section 01 67 00, Acceptance Testing of Membrane Equipment

3. Section 11 30 00, Hollow Fiber Membrane Equipment

C. Coordination

1. Coordinate the tagging of all equipment provided with the Buyer's asset tagging and management system.

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. Shop Drawings

1. Drawings and Samples

a. Provide tagging information as part of the Second Shop Drawing Submittal

b. Submit a complete listing of all equipment furnished along with both equipment manufacturer's (SKU) identification number and tag number for approval.

c. Submit the "Cross Reference Schedule" approved equipment manufacturer's (SKU) identification number and tag number for each piece of equipment furnished in electronic format for records.

1.04 SUBMIT THE PRODUCT DELIVERY STORAGE AND HANDLING

A. Refer to Section 01 61 00, Transportation and Handling of Goods.

**PART 2 -- PRODUCTS**

2.01 PROCESS SYSTEM DESIGN AND PERFORMANCE - NOT USED

2.02 EQUIPMENT DESIGN AND FABRICATION

A. General

1. Tagging

a. Tagging is used to identify facility, location / area, process, relative position within a process, and related systems. The purpose of tagging is for operations and maintenance personnel to be able to identify the equipment in the field.

b. Tag numbers are assigned to the placement of the equipment and remain if the actual equipment is replaced.

c. All process equipment, valves, instruments and controls will be given a tag.

d. Equipment numbers are assigned to a specific equipment item for the life of the item. When the equipment item is moved from the process, the equipment tag goes with the equipment item.

e. Tag numbering example

| Facility Code | | Location Code | | | Equipment Code | |
|---|---|---|---|---|---|---|
| Facility | Process Area | Process Location | Unit Number | Component ID | Sequence Number | Subprocess Sequence Number |
| Alder Creek WTP | MF | Unit | 01 | P | 10 | 30 |

f. All Component, Sequence Numbers, and Sub-Process Sequence Numbers for equipment contained as part of a duplicated process shall be the same component, sequence and sub-process designation. For example, all the MF Unit feed or filtrate pump(s) shall carry the final designation as P-1030. The designator for the Unit is contained in the Unit Number.

g. The Sequence Number and Sub Process Sequence Number shall not be duplicated for different Components. For example, a Flow Indicating Transmitter FIT-2020 shall not have a corresponding butterfly Valve BFV - 2020.

2. Equipment identification tags shall be provided for all equipment furnished by the Seller including:

   a. Seller Equipment (i.e., Units)

   b. Component Equipment (i.e., Pumps, Blowers, Compressors, Tanks)

   c. Instrumentation (i.e., Switches, Meters, Transmitters, and Analyzers)

   d. Mechanical Equipment (i.e., valves as shown on the P&ID's)

   e. Control Panel and Enclosures

   f. Miscellaneous items shown on the P&ID's

3. Each device shall be tagged to identify its number both in text formats. Identification numbers shall be displayed on the outside of equipment enclosures and panels. The tag size shall be a minimum of 1.5 inches by 3.5 inches. The tag number shall be engraved into the tags and shall have a minimum of 3/16-inch high alpha-numeric characters. The Seller shall include a separate Bar- Code identification tag to reflect the tag number using Code 39 and printed in a minimum of 24 point font size. Bar-codes shall be printed on adhesive-backed labels rated for exterior applications for both adhesion and fading for a minimum of seven years exposure. The Bar-Code shall be identifiable by the Buyer.

4. Tags shall be attached using stainless steel self-tapping machine screws where possible. If the use of a stainless steel screw is not possible, provide a stainless steel chain or stainless steel wire (18 gauge min) and affix to a non-removable part of the device.

B. Equipment Design Requirements (for equipment and processes design by others)

1. Equipment Tags

   a. Information to be permanently engraved onto the tag shall include the identifying tag number, equipment, manufacturer, model number, and part number.

   b. For valves, where applicable, include the valve model and the actuator model.

   c. Use 1/8-inch thick laminated phenolic for engraving composed of core, laminated on both sides with a matte (non-glare) finish cover sheet. Core to be black; cover sheet to be white. Tags shall be engraved with 3/16-inch letters, minimum

   d. Affix the bar-code, on the reverse of the tag.

e. Mounting holes to be centered on width and 1/4 inch from each end.

2. Control Panel Tagging:

a. All sensors and field instruments mounted on or within control panels and enclosures shall have the identification tag installed so that the engravings are easily visible to service personnel.

b. Equipment Asset tagging shall be provided for instrumentation located in control panel enclosures. Equipment Information shall be located on the front of the panels.

c. Tagging shall also be used to denote the function of all panel enclosure electrical devices including switches, lamp indicators, potentiometers and panel mounted instruments.

d. Control Panel Tags shall be constructed as follows:

1) 1/8-inch-thick laminated phenolic for engraving composed of core, laminated on both sides with a matte (non-glare) finish cover sheet.

2) Core to be black; cover sheet to be white

3) Tags shall be engraved with 3/16-inch letters, minimum

4) Mounting holes to be centered on width and 1/4 inch from each end.

5) Information to be permanently engraved onto the tag shall include the identifying tag number, manufacturer, model number, and part number

6) The tags shall be fastened to the control panel device with self-tapping stainless steel screws. Where fastening with screws is not permitted or impractical, the tags shall be attached to the device using permanent adhesive.

**PART 3 -- EXECUTION**

3.01 GENERAL

A. Verify the tagging of equipment as part of the Commissioning of the Goods, Refer to Section 01 67 00, Acceptance Testing of Membrane Equipment.

B. Provided custom labels as required to identify equipment and piping within the facility. Coordinate colors With the Buyer, however the general rules apply.

1. Feed - Green with white lettering

2. Filtrate - Blue with white lettering

3. Waste - Brown with white lettering

4. CIP System - Orange with black lettering

5. Chemical Hazard - Yellow with black Lettering

6. Compressed Air -Green with white lettering

7. Process Air- Green with white lettering

C. Label all piping at each membrane unit termination point. Denote direction of flow for single direction lines.

D. Label all piping within the ancillary support facilities including:

1. Clean-in-Place equipment

2. Compressors / Blowers

3. Reverse Filtration/Chemically Enhanced Backwash

END OF SECTION

# SECTION 01 09 10 REFERENCE STANDARDS

## PART 1 - GENERAL

1.1 SUMMARY

A. Applicable Publications: Whenever in these specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is indicated, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Contract is advertised for Proposals shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth in the specifications or shown on the Drawings will be waived because of any provision of or omission from said standards or requirements.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The SELLER shall construct the Goods in accordance with the Contract Documents and the referenced portions of those referenced codes, standards, and specifications.

B. Reference standards include, but are not necessarily limited to, the following:

1. American National Standards Institute (ANSI)
2. American Society for Testing and Materials (ASTM)
3. American Water Works Association (AWWA)
4. American Welding Society (AWS)
5. Anti-friction Bearing Manufacturers Association (AFBMA)
6. Canadian Standards Association (CSA)
7. Hydraulic Institute (HI)
8. Institute of Electrical and Electronics Engineering (IEEE)
9. National Electric Code (NEC)
10. National Electrical Manufacturers Association (NEMA)
11. National Sanitation Foundation (NSF)
12. Underwriters Laboratory, Inc. (UL)
13. International Building Code (IBC)

C. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and direction prior to ordering or providing any materials or furnishing labor. The SELLER shall bid for the most stringent requirements.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 09 20 ABBREVIATIONS AND SYBMOLS

## PART 1 -- GENERAL

### 1.1 DESCRIPTION

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these specifications, the following acronyms or abbreviations which may appear shall have the meanings indicated herein.

### 1.2 GENERAL ABBREVIATIONS

Common abbreviations that may be found in the Contract Documents include, but are not limited to, the following:

| | | | |
|---|---|---|---|
| acrylonitrile butadiene styrene | ABS | alternating current | a-c, AC |
| American wire gauge | AWG | ampere | A |
| average | avg | brake horsepower | bhp |
| British thermal unit | Btu | Centigrade (or Celsius) | C |
| centipoise | cp | chlorinated polyvinyl chloride | CPVC |
| cleanout | CO | company | Co |
| cubic feet per minute | cfm | cubic feet per second | cfs |
| cubic foot | cu ft | cubic inch | cu in |
| cubic yard | cu yd | decibel | db |
| decibels, A-weighted | dBA | degree Centigrade (or Celsius) | ˚C |
| degree Fahrenheit | ˚F | diameter | dia |
| direct current | dc | dollars | $ |
| ductile iron | DI | each | ea |
| efficiency | eff | elevation | El |
| ethylene propylene rubber | EPDM | Fahrenheit | F |
| feet | ft | feet per hour | fph |
| feet per minute | fpm | feet per second | fps |
| fiberglass reinforced plastic | FRP | figure | Fig |
| flange | flg | foot-pound | ft-lb |
| gallons (U.S.) | gal | gallons (U.S.) per hour | gph |
| gallons (U.S.) per minute | gpm | gallons (U.S.) per second | gps |

| | | | |
|---|---|---|---|
| gallons (U.S.) per square foot day | gfd | galvanized | galv |
| gauge | ga | hand/off/automatic | HOA |
| Hertz | Hz | horsepower | hp |
| hour | hr | inch | in |
| inch-pound | in-lb | input/output | I/O |
| instrumentation and control | I&C | kilovolt | KV |
| kilovolt-ampere | kva | kilowatt | kw |
| kilowatt-hour | kw-hr | length | l |
| length to least radius of gyration | l/r | light emitting diode | LED |
| linear | lin | linear foot | LF |
| liter | L | liter per hour square meter | L/hr-$m^2$ |
| maximum | max | mercury | Hg |
| Membrane System Supplier | M | Microfiltration | MF |
| micron | µm | milli-amp | mA or ma |
| milliampere DC | mADC | milligram | mg |
| milligrams per liter | mg/L | milliliter | mL |
| millimeter | mm | million gallons (U.S.) | MG |
| million gallons per day (U.S.) | mgd | minimum | min |
| motor control center | MCC | National Pipe Threads | NPT |
| nephelometric turbidity units | ntu | net positive suction head available | NPSHA |
| net positive suction head required | NPSHR | Operation and Maintenance | O&M |
| ounce | oz | outside diameter | OD |
| parts per million | ppm | Permeability | 1/R |
| polytetrafluoroethylene | PTFE | polyvinyl chloride | PVC |
| pound | lb | pounds per square foot | psf |
| pounds per square inch | psi | pounds per square inch absolute | psia |
| pounds per square inch differential | psid | pounds per square inch gage | psig |
| Process and Instrumentation Diagrams | P&ID | random access memory | RAM |
| resistance | R | revolutions per minute | rpm |
| Silt Density Index | SDI | specific gravity | sp gr |

| | | | |
|---|---|---|---|
| square foot | sq ft | square inch | sq in |
| square yard | sq yd | stainless steel | SS |
| standard | std | standard cubic feet per minute | scfm |
| total dynamic head | TDH | totally-enclosed, fan-cooled | TEFC |
| totally-enclosed, non ventilated | TENV | twisted shielded | TWSH |
| variable frequency drive | VFD | volt | V |
| volts alternating current | VAC | volts direct current | VDC |
| water column | WC | | |

## 1.3 INSTITUTIONAL ABBREVIATIONS

Abbreviations of institutions or organizations that may be used in the Contract Documents include, but are not limited to, the following:

| | |
|---|---|
| ABMA | American Bearing Manufacturers Association |
| AFBMA | Anti-Friction Bearing Manufacturers Association |
| AGA | American Gas Association |
| AGMA | American Gear Manufacturers Association |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| AMPP | Association for Materials Protection and Performance |
| ANSI | American National Standards Institute, Inc. |
| APWA | American Public Works Association |
| ASCE | American Society of Civil Engineers |
| ASTM | American Society for Testing and Materials |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| CSA | Canadian Standards Association |
| EI | Energy Institute |
| EJCDC | Engineers Joint Contract Documents Committee |
| EPA | Environmental Protection Agency |
| HI | Hydraulic Institute |
| IBC | International Building Code |
| IECC | International Energy Conservation Code |
| IEEE | Institute of Electrical and Electronics Engineers |
| IFC | International Fire Code |
| IFGC | International Fuel Gas Code |
| ISA | Instrument Society of America |
| ISO | Insurance Services Office |
| MSS | Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. |
| NAAMM | National Association of Architectural Metal Manufacturers |
| NBS | National Bureau of Standards |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturers Association |
| NESC | National Electrical Safety Code |
| NSF | National Sanitation Foundation |
| OSHA | Occupational Safety and Health Administration |

| | |
|---|---|
| SAE | Society of Automotive Engineers |
| SPI | Society of the Plastics Industry, Inc. |
| SSPC | Steel Structures Painting Council |
| SSPWC | Standard Specifications for Public Works Construction |
| TEMA | Tubular Exchange Manufacturers Association |
| IBC | International Building Code |
| IFC | International Fire Code |
| UL | Underwriters Laboratories, Inc. |
| USEPA | United States Environmental Protection Agency |
| WEF | Water Environment Federation |

1.4 Symbols

A. Refer to Drawings for symbols used on drawings.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 33 17 – STRUCTURAL DESIGN, SUPPORT AND ATTACHMENT

## PART 1 -- GENERAL

1.01 SUMMARY

A. The Seller shall provide calculations and details for structural and non-structural components, supports, and anchorages as required by the Contract Documents and the 2022 Oregon Structural Specialty Code (OSSC). The Shall shall furnish all such structural and non-structural components, supports, attachments, and anchorages in accordance with the calculations and details for installation by Contractor.

B. Where a conflict exists between the requirements of the Contract Documents and the OSSC, the more stringent requirement shall apply.

C. Design parameters used to determine Seismic and Wind design forces shall be as listed herein.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Reference Specifications:

1. Section 01 34 00, Shop Drawing Procedures

B. The edition of the standards applicable to the Work shall be those editions referenced by the 2022 OSSC. If the standard is not referenced by the OSSC-referenced standard listed below, the edition of the standard applicable to the Work shall be the edition in effect on the date of signing and sealing of the contract specifications.

| | |
|---|---|
| OSSC | 2022 Oregon Structural Specialty Code |
| **American Society of Civil Engineers (ASCE)** | |
| ASCE 7 -16 | Minimum Design Loads and Associated Criteria for Buildings and Other Structures. |
| **American Concrete Institute (ACI)** | |
| ACI 318 | Building Code Requirements for Structural Concrete (2014 edition) |

1.03 SUBMITTALS

A. Furnish submittals in accordance with Section 01 34 00, Shop Drawing Procedures..

1. Calculations and Details

2. Calculations and details are considered a Deferred Submittal as defined in the OSSC.

3. Calculations and details shall be complete, accurate, and in accordance with the requirements of the OSSC and ASCE 7 and shall be signed and sealed by a Professional Engineer registered in the State of Oregon.

4. Calculations shall be clear and concise and show equipment and other non-structural component anchorage forces and the capacities of the anchorage

elements proposed by the Seller. The calculations shall substantiate a complete load path from the component or equipment being anchored into the supporting structure or foundation.

5. The calculations and details shall demonstrate a complete lateral and vertical load path and shall clearly indicate all forces imposed on the supporting structure.

6. Calculations and details are required for all Non-Structural components, supports, anchorages, and attachments.

    a. Non-Structural components shall include all architectural, mechanical, and electrical components, equipment, piping, ductwork, and all other similar or related appurtenances necessary to produce the complete architectural, mechanical, and electrical systems.

7. When the Contract Documents require the Seller to design structures or structural components, calculations and details for those structures and structural components, and their supports, anchorages, and attachments, are required.

8. When computer generated calculations and analyses are included as part (or as the whole) of the calculations, the calculations shall include, but not be limited to, the following: derivations of all input parameters; clear indication of the applicable load combinations and building code equations; diagrams of all members, geometry, loads, forces, reactions and deflections, for all components and connections; and output results demonstrating all stress, force, deflection and other Contract Document and building code requirements have been satisfied.

9. All calculations associated with anchorage into concrete or masonry shall be done using Strength Level forces and shall be in accordance with the applicable provisions of ACI 318.

10. Refer to Part 2 below for additional requirements.

**PART 2 -- PRODUCTS**

2.01 GENERAL

A. Non-Structural Component Supports and Anchors

1. Unless otherwise indicated, non-structural component supports, anchors, and restrainers shall be adequately designed for all applicable static, dynamic, operational, seismic and wind loads.

    a. Wall-mounted equipment weighing more than 250 pounds or which is within 18-inches of the floor shall be provided with fabricated steel supports. Pedestals shall be of welded steel or engineered framing support systems. If the supported equipment is a panel or cabinet or is enclosed with removable sides, the pedestal shall match the supported equipment in appearance and dimensions.

b. All equipment and all other non-structural components shall be supported and anchored in place by methods that satisfy the building code and the Contract Documents.

c. All equipment and all other non-structural components shall be supported and anchored in place by methods that satisfy the manufacturer's applicable seismic certification requirements.

2. Component attachments shall be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.

B. Non-Building Structures

1. Non-Building Structures shall be designed in accordance with ASCE 7 Chapter 15.

2. Non-Building Structures, foundations, supports, anchors, and restrainers shall be adequately designed for all applicable static, dynamic, operational, seismic and wind loads.

C. Anchors – General

1. Anchor bolts shall be cast-in-place unless otherwise noted or approved by the Engineer.

2. The Contractor shall determine the size, type, capacity, location, and other placement requirements of anchorage elements. Anchoring methods and leveling criteria in the manufacturer's literature shall be followed. Submit methods and criteria with the calculations and details.

3. Anchor bolt calculations shall clearly show that the capacity of the anchor and the capacity of the concrete that the anchor is embedded in are adequate to resist all applicable load combinations, including seismic and wind loads.

a. The design of anchors resisting seismic forces shall satisfy the ductility requirements stated in the IBC, ASCE 7, ACI 318.

4. Reduction factors associated with edge distance, embed length, grout and base plate thickness, and bolt spacing shall all be considered and based on the actual dimensions of the concrete or masonry that resists the anchorage forces.

5. Where anchorage is required into or through equipment pads, the following requirements shall apply unless otherwise approved by the Engineer:

a. For tensile forces, the embed length and associated concrete failure zone shall be provided entirely within the structural slab. No portion of the equipment pad may be considered as effective in resisting tensile forces.

b. For shear forces, the edge distance and associated concrete failure zone shall be provided entirely within the equipment pad. No portion of the structural slab may be considered as effective in resisting shear forces.

6. Anchor bolt details shall include required bolt diameter, embed, spacing, and edge distances.

7. Where additional reinforcement is required to satisfy anchorage requirements, such reinforcement shall be included in the anchorage details, and shall be furnished and installed by the Contractor.

D. Mechanical and Electrical Equipment Foundations

1. The Seller, through the equipment manufacturer, shall verify the size and weight of the equipment foundation to ensure compatibility with equipment.

2. Equipment foundation dimensions shall be coordinated with the equipment base geometry and the edge distance and embed requirements of the equipment anchorage calculations.

E. Mechanical and Electrical Equipment (Housekeeping) Pads

1. General

a. Equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on concrete equipment pads, unless otherwise indicated. The top surface of the equipment pads shall be level, unless otherwise indicated, or otherwise required by the equipment manufacturer.

b. Equipment pads shall be sized to accommodate the bearing and anchorage requirements of the equipment, subject to the constraints listed below.

c. Final geometry of the equipment pads shall not result in a condition that violates applicable building code provisions, including but not limited to the provisions of the National Electric Code.

2. Mechanical Equipment Pads

a. Mechanical equipment pad heights shall be coordinated with process equipment and piping elevation requirements. Where no such elevation constraints exist, the equipment pad height shall be as shown on the drawings, or as indicated below when no specific height is provided.

1) Equipment pads for mechanical equipment shall be 3.5 inches tall (maximum) at the front of the equipment.

b. Mechanical equipment pads shall extend not more than 2 inches beyond the front, back, and sides of the equipment, except as indicated below, unless otherwise shown on the drawings.

1) Where necessary to meet seismic or wind anchorage requirements, the pads may be extended beyond the 2 inch limit indicated above. The pads shall extend not more than 6 inches beyond the front, back, and sides of the equipment.

3. Electrical Equipment Pads

a. Electrical equipment pads shall be 3.5 inches tall (maximum) at the front of the equipment.

b. Electrical equipment pads shall extend not more than 2 inches beyond the front, back, and sides of the equipment, except as indicated below, unless otherwise shown on the drawings.

c. Where necessary to meet seismic anchorage requirements, the pads may be extended beyond the 2 inch limit indicated above. The pads shall extend not more than 6 inches beyond the front, back, and sides of the equipment.

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 34 00 SHOP DRAWING PROCEDURES

## PART 1 -- GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. This Section specifies the methods and requirements for submittals including Shop Drawings and Product Data. Additional requirements are contained in Article 5 of the General Conditions. Specific requirements for Shop Drawings are denoted in the applicable Sections.

B. Submittal for each Section shall be provided with a separate transmittal form. Submittals shall be completed and organized by the Section noted in the table at the end of this Section. Each submittal shall be clearly identified by reference to applicable Section Number. Submittals shall clearly reference the Contract Number and bear the identification of the Seller. Submittals shall be clear and legible and of sufficient size for presentation of data. Each submittal shall be signed by the Seller.

C. Failure to provide the Shop Drawings as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Engineering Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until acceptable Shop Drawings have been provided.

D. Reference Specifications

1. Section 11 30 00, Hollow Fiber Membrane Equipment

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings as specified in individual Sections include, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the work.

2. All shop drawings submitted by subcontractors or component equipment suppliers shall be sent directly to the Seller for checking. The Seller shall be responsible for coordination and checking their submittals before submitting to the Engineer for review and approval.

3. The Shop drawing submittal shall identify a single manufacturer or provider of component equipment. Shop Drawings that identify multiple suppliers for the same item will be rejected.

4. The Seller shall check all subcontractors or component equipment suppliers shop drawings regarding measurements, size of members, materials of construction and fabrication details to make sure that they conform to the Drawings and Specifications.

5. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

6. For all tagged devices supplied, the Seller shall develop an “Equipment Cross Reference Schedule” per Section 01 08 00, Identification and Tagging, that matches the Tag to the appropriate equipment manual. The Cross Reference Schedule shall be provided for each section submitted.

    a. The equipment schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range. The Equipment Cross- Reference Schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

    b. Provide a separate listing for all Membrane Unit Equipment, including cross-reference schedules with the Membrane Unit (Section 11 30 00, Hollow Fiber Membrane Equipment) submittal. Equipment that is not considered part of the Membrane Unit shall be submitted with the appropriate division submittal.

7. Drawings: Provide in PDF format with bookmarks.

8. Standard product data shall be clearly identified with reproducible arrows or other marking indicating the parts to be supplied with the equipment. Any parts or equipment not provided shall be marked out. In the event that an individual product data sheet has multiple items selected, refer to the Equipment Cross Reverence Schedule, to obtain the relevant model and part number.

B. Product Data

1. Product data as specified in individual Sections include, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare- parts listing and printed product warranties, as applicable to the work.

C. Samples

1. Samples specified in individual Sections include, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Buyer for independent inspection and testing, as applicable to the work.

1.03 SELLER'S RESPONSIBILITIES

A. Review shop drawings, product data and samples, including those by component equipment suppliers and subcontractors, prior to submission to determine and verify the following:

1. Measurements

2. Construction criteria

3. Catalog numbers and similar data

4. Conformance with related Sections

B. Each shop drawing, sample and product data submitted by the Seller shall have affixed to it the following Certification Statement including the Seller's Company name and signed by the Seller designated Project Manager. Shop drawings and product data sheets shall be organized using bookmarks in PDF format and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package.

C. A separate transmittal form shall be used for each section where submittal is required. Transmittal of Shop Drawings on various items using a single transmittal form shall be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole.

D. The Seller shall utilize a 9-character submittal identification numbering system in the following manner:

1. The first six digits shall be the applicable Section Number.

2. The next two digits shall be the numbers 01 to 99 to sequentially number each initial separate item or drawing submitted under each specific Section Number.

3. The last character shall be a letter, A to Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

11 30 00-01-B

11 30 00 = Section for hollow fiber membrane equipment

01 = The eighth submittal under this section

B = The second submission (first resubmission) of that particular shop drawing.

4. Once information for a section has been prepared to completion, it may be submitted to the Engineer for review. However, if the Engineer determines that the review and approval of the section is contingent upon receipt of additional submittal information, the review of that section shall not be performed until all information has been received.

E. Notify the Buyer and Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

F. The review and approval of shop drawings, samples or product data by the Buyer and Engineer shall not relieve the Seller from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Seller and the Buyer and Engineer will have no responsibility therefor. The Buyer and the Engineer may review the conformance of all Goods and Special Services with respect to the Contract Documents at any time prior to Final Acceptance.

G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.04 SUBMITTAL REQUIREMENTS

A. Make submittals promptly in accordance with the Contract Times specified in Article 5 of the General Conditions.

B. Schedule and Coordination Meetings

1. The Seller shall submit Shop Drawings Table A and Table B of this Section.

2. Within 10 days after the issuance of the First Shop Drawing the Seller shall meet with the Engineer and Buyer at the Buyers location to review and receive comment regarding the Shop Drawing Submittal.

3. Within 10 days after the issuance of the Second Shop Drawing Submittal, the Seller shall meet with the Engineer and Buyer at the Buyers location to review and receive comment regarding the Shop Drawing Submittal.

C. Each submittal, appropriately coded, will be returned within 15 working days following receipt of submittal by the Engineer.

D. Number of submittals required:

1. Shop Drawings: 1 electronic copy in PDF format.

2. Samples: Submit the number stated in the respective Sections.

3. Drawings: 1 electronic copy in PDF format.

E. A letter of transmittal shall accompany each submittal.

F. At the beginning of each letter of transmittal, provide a reference heading indicating the following:

| | |
|---|---|
| Buyer's Name | City of Sandy |
| Project Name | Sandy Program Management |
| Contract No. | Alder Creek WTP |
| Transmittal No. | |
| Section No. | |

G. All Shop Drawings submitted shall bear the stamp of approval and signature of the Seller as evidence that they have been reviewed by the Seller. Submittals without this stamp of approval will not be reviewed by the Buyer and will be returned to the Seller. The Seller's stamp shall contain the following information:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Seller identification.

4. Name of the following:

   a. Seller

   b. Supplier, Distributor or Manufacturers Representative

   c. Manufacturer (i.e. Component Equipment Manufacturer)

5. Identification of the product, with the section number, page, and paragraph(s), drawing number.

6. Identification of deviations from Contract Documents.

7. Identification of revisions on resubmittals.

8. A blank 3-inch x 4- inch space for Engineers review stamp.

9. Where calculations are required to be submitted by the Seller, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

H. All Shop Drawings submitted for approval shall have a title block with complete identifying information satisfactory to the Buyer

1.05 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

A. Refer to Article 5.06 of the General Conditions.

B. One marked up electronic PDF format copy will be returned to the Seller under one of the following notations.

1. "NO EXCEPTIONS TAKEN" is assigned when there are no notations or comments on the submittal. When returned under this code the Seller may release the equipment and/or material for manufacture, unless specifically noted in the Agreement or the General Conditions.

2. "MAKE CORRECTIONS NOTED". This code is assigned when a confirmation of the notations and comments IS NOT required by the Seller. The Seller may release the equipment or material for manufacture unless specifically noted in the Agreement or the General Conditions; however, all notations and comments must be incorporated into the final product without exception.

3. "MAKE CORRECTIONS NOTED/CONFIRM". This combination of codes is assigned when a confirmation of the notations and comments IS required by the Seller. The Seller may, at his own risk, release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Buyer and Engineer within 15 working days of the date of the Engineer's transmittal requiring the confirmation.

4. "AMEND - RESUBMIT". This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non- conforming items that were noted. Resubmittal is to be received by the Buyer and Engineer within 15 working days of the date of the Engineer's transmittal requiring the resubmittal.

5. "REJECTED - RESUBMIT" is assigned when the submittal does not meet the intent of the Contract Documents. The Seller must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.

6. "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the Seller.

7. Items 1 through 5 designate the status of the reviewed submittal with Item 6 showing there has been an attachment of additional data.

C. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Seller shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittial shall clearly respond to each comment made by the Buyer and Engineer on the previous submission. Additionally, the Seller shall direct specific attention to any revisions made other than the corrections requested by the Buyer and Engineer on previous submissions.

D. Partial submittals may not be reviewed. The Buyer and Engineer will be the sole judge as to the completeness of a submittal. Submittals not complete will be returned to the Seller and will be considered "Rejected" until resubmitted. The Buyer and Engineer may at his option provide a list or mark the submittal directing the Seller to the areas that are incomplete.

E. If the Seller considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Seller shall give written notice thereof to the Buyer and Engineer at least 7 working days prior to release for manufacture.

F. When the shop drawings have been completed to the satisfaction of the Buyer and Engineer, the Seller shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Buyer and Engineer.

G. All Shop Drawings and Samples shall be submitted prior to the dates established in Article 5 of the Agreement. For any Shop Drawing that is submitted after the dates established in Article 5 of the Agreement, if the Shop Drawing is deemed

H. “AMEND - RESUBMIT” or “REJECTED” the Buyer shall notify the Seller within five working days after receipt of the Shop Drawings that the shop drawings furnished were not acceptable. Upon notification, the Seller has ten working days to produce and deliver to the Buyer an acceptable Shop Drawing(s).

I. In the event that the Seller requests an “or equal” for a previously approved item, all of the Engineer’s costs in the reviewing and approval of the “or equal” will be back-charged to the Seller, unless the need for such “or-equal” is beyond the Seller’s control.

1.06 DISTRIBUTION

A. In accordance with the requirements of Section 01 73 00, Installation, Operation and Maintenance Manuals, distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Buyer and Engineer. Number of copies shall be as directed by the Buyer and Engineer.

1.07 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

1.08 GENERAL PROCEDURES FOR SUBMITTALS

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Seller’s failure to transmit submittals in a timely manner.

B. Submit Shop Drawings to the Engineer(s) at the addresses indicated below:

Stantec Consulting Services, Inc.
c/o Adam Odell, P.E.
Tel:(503) 220-5409
Adam.Odell@stantec.com

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

**PART 4 -- SUPPLEMENTAL INFORMATION**

## FIRST SHOP DRAWING SUBMITTALS -- TABLE A

| SECTION | TITLE | PARAGRAPH | DATE SUBMITTED | DATE APPROVED |
|---|---|---|---|---|
| 01 74 00 | Membrane System and Module Warranty | 1.03A | | |
| 09 90 00 | Painting | 1.03A | | |
| 11 21 10 | Horizontal End Suction Pumps | 1.03A | | |
| 11 24 90 | Fiberglass Reinforced Plastic Tank | 1.03.A.1 | | |
| 11 30 00 | Hollow Fiber Membrane Equipment | 1.03A.2.a | | |
| 11 34 00 | Automatic Self-Cleaning Strainers | 1.03A | | |
| 11 37 00 | Compressed Air System | 1.03A | | |
| 11 37 10 | Blower Positive Displacement | 1.03A | | |
| 11 39 10 | Diaphragm Pumps | 1.03A | | |
| 11 39 50 | Vertical Inline Centrifugal Booster Pumps | 1.03A | | |
| 11 40 05 | Strainers | 1.03A | | |
| 13 32 70 | Process Instrumentation General Requirements and Switches | 1.03A | | |
| 13 32 80 | Process Instrumentation Meters and Transmitters | 1.03A | | |
| 13 32 90 | Process Instrumentation Analyzers | 1.03A | | |
| 15 10 00 | Ball Valves | 1.03A | | |
| 15 10 10 | Butterfly Valves | 1.03A | | |
| 15 10 40 | Check Valves | 1.03A | | |
| 15 10 50 | Specialty Valves | 1.03A | | |
| 15 10 60 | Valve Actuators | 1.03A | | |
| 16 48 20 | Variable Frequency Drive Units | 1.03A | | |

## SECOND SHOP DRAWING SUBMITTALS -- TABLE B

| SECTION | TITLE | PARAGRAPH | DATE SUBMITTED | DATE APPROVED |
|---|---|---|---|---|
| 01 08 00 | Identification and Tagging | 1.03A | | |
| 01 75 00 | Spare Parts | 1.03A | | |
| 05 05 19 | Post-Installed Concrete Anchors | 1.03A | | |
| 11 24 90 | Fiberglass Reinforced Plastic Tanks | 1.03A.2 | | |
| 11 30 00 | Hollow Fiber Membrane Equipment | 1.03A.2.b | | |
| 13 32 00 | Instrumentation and Control System Functional Description | 1.03A | | |
| 13 32 10 | Instrumentation and Control System General Requirements | 1.03A | | |
| 13 32 50 | Programmable Logic Control Equipment | 1.03A | | |
| 13 32 60 | SCADA System | 1.03A | | |
| 13 33 00 | Control Panels, Enclosures, and Panel Instruments | 1.03A | | |
| 15 06 20 | Stainless Steel Pipe and Tubing | 1.03A | | |
| 15 07 00 | PVC and CPVC Piping Systems | 1.03A | | |
| 15 07 10 | HDPE Piping Systems | 1.03A | | |
| 16 15 00 | Manufactured Wiring Systems | 1.03A | | |

# P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the [State] [Commonwealth] of _____ and that he/she has been employed by

_____ to design
(Name of Seller)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the

_____.
(Name of Project)

The undersigned further certifies that he/she has performed the design of the _____, that said design is in conformance with all
(Name of Project)

applicable local, state, and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the

_____
(Insert Name of Buyer)

or Buyer's representative within seven days following written request therefor by the Buyer.

| | |
|---|---|
| _____ | _____ |
| P.E. Name | Seller's Name |
| _____ | _____ |
| Signature | Signature |
| _____ | _____ |
| Address | Title |
| | _____ |
| | Address |

END OF SECTION

# SECTION 01 61 00 TRANSPORTATION AND HANDLING OF GOODS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. The Seller shall make all arrangements for transportation and delivery of equipment and materials to the Point of Destination.

2. Shipments of materials shall be delivered to the Point of Destination only during regular working hours. Shipments shall be addressed, and delivered to the Contractor, except where otherwise directed.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) - (NOT USED)

1.03 SUBMITTALS

A. Shipping List

1. Prior to the delivery of the Goods, the Seller shall develop and submit to the Contractor a Bill of Materials for the contents of all shipments. This list shall detail contents, size, weights and tag numbers of each item shipped. Upon receipt of the Goods, the Bill of Materials shall be used to determine that the Goods have been received by the Contractor in accordance with Article 5 of the General Conditions.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. The Seller shall arrange deliveries of products in accordance with the Contract Time requirements stipulated in the Agreement.

B. The Seller shall coordinate deliveries that occur between specified Contract Times to accommodate the following:

1. Work of other Contractors or Buyer

2. Limitations of storage space

3. Availability of equipment and personnel for handling products

C. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment to simplify accumulation of parts and facilitate assembly.

D. Each part within a shipment shall be clearly labeled with the reference numbers and tag numbers included in the Bill of Materials.

E. Upon delivery, the Seller and Contractor, shall inspect shipment(s) to ensure:

1. Product complies with requirements of approved submittals

2. Containers and packages are intact

3. Labels are legible

4. Products are properly protected and undamaged

F. The Contractor will provide equipment and personnel necessary to handle products by methods designed to prevent soiling or damage.

G. The Contractor will provide storage facilities in accordance with the Seller storage requirements to be submitted prior to delivery and along with the delivered equipment under Section 01 61 10, Protection of Goods.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 61 10 PROTECTION OF GOODS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. The Seller shall protect Goods in accordance with manufacturer's recommendations and the requirements of the Contract Documents.

2. The Seller shall make all arrangements and provisions necessary for the protection of Goods during delivery to the Point of Destination.

3. Manufacturer's containers may be opened for inspection and verification of the Goods in accordance with Article 8 of the General Conditions. Upon completion of inspection, the Goods shall be repackaged and remain unopened until the time of installation, unless recommended by the manufacturer or otherwise specified.

4. The Seller shall provide the Buyer and the Contractor with a list of Goods that are to be delivered prior to shipment.

B. Reference Specifications - Not Used

C. Coordination: The Seller shall coordinate with the Buyer and Contractor for Goods that require special protection, storage or handling

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC) — NOT USED

1.03 SUBMITTALS

A. Provide submittals required by this section, at least 30 days prior to delivery of the Goods.

B. The Seller shall provide the Contractor with a, list of pumps, motors, drives, electrical, equipment, instrumentation equipment (controls, devices, panels, etc.), and other equipment having anti-friction or sleeve bearings for storage in weather tight storage facilities, such as warehouses.

C. The Seller shall provide the Contractor with a list of all panels, microprocessor-based equipment, and all other Goods and devices subject to damage or useful life decrease due to:

1. Temperatures below 40˚F or above 120˚F

2. Relative humidity above 90 percent

3. Or exposure to rain

D. Fully Protected Storage

1. The Seller shall provide the Contractor with a list. of Goods which could be damaged by low or high temperature and require temperature-controlled storage space.

2. The Seller shall provide the Contractor a list of Goods that require protection from contamination by dust, dirt, and moisture.

3. The Seller shall provide the Contractor with a list of Goods that require storage at specific humidity levels as recommended by manufacturer.

E. Seller Storage and Handling Instructions

1. The Seller shall provide specific storage and handling instruction for each loose-shipped item of equipment, instrumentation, materials and crates provided by the Seller.

2. The Seller shall identify requirements for storage and handling of the membrane modules.

3. The Seller shall identify the solution used for storage of the membrane modules.

1.04 PRODUCT STORAGE AND HANDLING

A. Goods shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. Each container shall be clearly marked with the Seller's name, project name, and location. Goods shall be protected from exposure to the elements and shall be kept thoroughly dry at all times.

B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged prior to acceptance shall be repainted.

1. All parts shall be protectively wrapped and/or packaged, using materials commensurate with the weight and configuration of the part, the method of handling, and the method of transportation.

2. Contact or pressure points shall be sufficiently protected when using steel or J elastic banding.

3. Cabinets and equipment too heavy to be handled or transported by one man shall be adapted for handling with pallet trucks and/or forklifts.

4. Painted surfaces which will come in contact with lifting forks or other handling equipment (such as the bottom of cabinets or skid base frame, members) shall be sufficiently padded with heavy corrugated cardboard, foam or other protective materials.

5. Small equipment and skids shall be mounted on wooden pallets designed for fork lifting. This equipment shall be bolted (using existing holes in the frame) or strapped to the pallet to prevent tipping. Equipment and skids too large to be mounted on pallets shall have wooden block damage bolted or strapped to the base foundation pads to prevent paint degradation during handling, assembly and installation.

C. Electrical equipment, controls, and instrumentation shall be protected against moisture or water damage. Space heaters provided in the equipment will be connected by the Contractor as noted by the Seller and operated at all times until equipment is placed in operation.

D. Containerized Membrane Filtration Units shall be delivered to the site as assembled units to the fullest degree possible.

E. Notice of Enclosed Instructions: All delivered packages containing Goods shall have notices clearly visible on the exterior of the package indicating that maintenance instructions are enclosed.

F. Panel and Instrumentation Storage: All packages containing panels; electronic devices, and other microprocessor-based equipment shall contain a desiccant, volatile corrosion inhibitor (VCI) blocks, a moisture indicator, and maximum-minimum indicating thermometer. The Seller shall provide a spare set of such protection equipment including a desiccant, a moisture indicator, and VCI blocks for each package containing panels, electronic devices, and other microprocessor-based equipment for replacement by the Contractor during the storage period.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION

# SECTION 01 62 00 INSTALLATION OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Seller shall coordinate all services and activities required by this section with the Buyer, Contractor and the Engineer.

1. Upon completion of installation, the Engineer shall issue a “Notice of Completed Installation”.

B. Reference Specifications:

1. Section 01 61 00 Transportation and Handling of Goods
2. Section 01 61 10 Protection of Goods
3. Section 01 66 00 Commissioning of Membrane Equipment
4. Section 01 73 00 Installation, Operation and Maintenance Manuals
5. Division 11 Equipment

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. Pre-Delivery Submittals

1. In accordance with Section 01 61 00, Transportation and Handling of Goods, the Seller shall provide to the Contractor a listing of Goods to be transported to the Point of Destination.
2. In accordance with Section 01 61 10, Protection of Goods, the Seller shall provide to the Contractor a listing of Goods that require protection. Special storage, protection, and handling instructions shall be provided for these items.
3. In accordance with Section 01 73 00, Installation, Operation and Maintenance Manuals shall be provided.

## PART 2 -- PRODUCTS – (NOT USED)

## PART 3 -- EXECUTION

3.01 INSTALLATION

A. The Seller shall provide training to the Contractor for installation of membrane equipment. The training shall be conducted on-site by an authorized, experienced, employee of the Seller.

B. An employee of the Seller shall be present on-site to oversee the proper placement and installation of at least one (1) Seller units and ancillary equipment supplied by the Seller including but not limited to tanks, pumps, and control panels.

C. This representative of the Seller shall also be present to oversee the assembly installation of the associated anchor bolts for Seller-furnished equipment.

D. Seller shall be responsible for identification of the volume and concentration of the membrane module storage solution and rinsing requirements for the membrane modules.

E. Contractor shall be responsible for making adjustments and/or modifications to the installation process that may become necessary to ensure that the equipment is properly installed.

F. After the installation is complete, the Seller, Contractor, and Engineer shall jointly perform a pre-commissioning inspection of the containerized membrane system. The inspection shall identify the following:

1. Mechanical

    a. Containerized Membrane units shall be completely installed and unit and interconnecting piping pressure tested.

    b. The Process Air System piping supplying pressurized air from the containerized membrane units to the neutralization system shall be completely installed and the piping pressure tested.

2. Electrical

    a. All local control panels shall be installed and terminations completed.

    b. All 480V, 120V, and 24VDC power supplies shall be connected and verified.

    c. The documentation associated with the inspection of electrical terminations shall be provided by the Contractor to the Seller.

G. Contractor shall be responsible for making adjustments and/or modifications to the installation process that may become necessary to ensure that all equipment is properly installed.

1. The inspection shall identify equipment that has not been properly installed, detailing the outstanding installation issues on a “punch list”, and noting the party who shall be responsible for each correction and identify the items that require correction before commissioning can begin.

2. Once the corrections identified have been made, a “Notice of Completed Installation” shall be issued by the Engineer and commissioning shall commence in accordance with the requirements of Section 01 66 00, Commissioning of Membrane Equipment.

# SECTION 01 66 00 COMMISSIONING OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work: The Seller shall commission the membrane equipment and place the system into operation. Commissioning is subject to the following provisions:

1. Commissioning shall not commence until the “Notice of Completed Installation” is issued in accordance with Section 01 62 00, Installation of Membrane Equipment.

2. Commissioning shall be completed by the Seller within the allocated time as identified in the Agreement.

3. The Engineer shall document the time when the facilities are substantially unavailable for use by the Seller to perform commissioning. Potential times of substantial unavailability include: 1) when the installation of membrane modules results in a delay to the Seller, 2) when the Engineer conducts its review of system operation and 3) circumstances beyond the control of the Seller including but not limited to power outages, lack of feedwater, inability to transfer product water or feedwater due to factors beyond the control of the Seller, not having adequate staff from the Contractor or the Buyer. If in the sole opinion of the Engineer the facilities are substantially unavailable to the Seller, equivalent additional commissioning time will be granted.

4. Failure to complete the Commissioning as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until commissioning is complete.

5. Upon completion of Commissioning, the Engineer shall issue the “Notice of Completed Commissioning.”

B. The Seller shall coordinate all services and activities required by this Section with the Contractor, the Engineer and the Buyer. These activities shall be coordinated with the requirements of Section 13 32 30, Instrumentation and Control System Commissioning.

C. The Seller shall perform all other tests required by the Specifications.

D. Reference Specifications:

1. Section 01 73 10, Training of Operations and Maintenance Personnel

2. Section 11 30 00, Hollow Fiber Membrane Equipment

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. The Seller shall prepare a “Detailed Plan of Commissioning Activities” that will be used as a guideline for Commissioning of the Goods provided by the Seller. The Detailed Plan of Commissioning Activities shall be used to coordinate the activities of the Seller’s personnel. The “Detailed Plan of Commissioning Activities” will identify the Commissioning requirements for all Goods supplied by the Seller. The guidelines shall include the following minimum check items.

1. Pump(s), Metering Pumps, Blowers, Compressors and Other Rotating Equipment

    a. Filled with Oil

    b. Rotation is Proper

    c. Aligned Properly (Mechanical Seal has been set)

    d. Receives and responds to Process Control Command Signals (Discrete and/or Analog)

2. Instruments (Flow, Pressure, Level, Temperature and Analytical)

    a. Electrical Supply is Connected

    b. Software is Configured

    c. Responds to Position and Sends Discrete and Analog Signals

    d. Control Alarm Set Point has been established

    e. Instrument is calibrated

3. Switches (Flow, Pressure, Level and Temperature)

    a. Electrical Supply is Connected

    b. Sends Signal Upon Transition of State

    c. Are Calibrated

4. Automated Modulating Valves

    a. Air and/or Electrical Supply is Connected

    b. Responds to Position and Sends Feedback Signals

    c. Control Alarm Set Point has been established

5. Manual and Automatic Valves

    a. Air and/or Electrical Supply is Connected

b. Responds to and sends Feedback (Limit Switch) Signals

B. The “Detailed Plan of Commissioning Activities” will be used as a guideline for placing the facility into operation. The “Detailed Plan of Commissioning Activities” shall be coordinated with the activities of the Contractor, the Engineer and the Buyer. The guidelines shall include the following minimum check items.

1. Field Verification of Installed Equipment including:

a. Pumps, Compressors, Blowers, Tankage

b. Piping Systems and Temporary Connections

c. Electrical Control and Operator Interface Systems

2. Commissioning of Equipment

a. Feed Pumps, Filtrate Pumps (vacuum system), Vacuum Pumps, Metering Pumps, Compressors, Blowers

b. Switches, Transmitters, Analyzers

c. Modulating Manual and Automated Valves

3. Start-up Activities

a. Feed, Filtered Water and Backwash Flow Pressure and Level Control Sequences

b. Membrane Treatment Unit Operations including filtration, backwashing clean in place and membrane integrity testing.

c. Normal and Emergency Start Up and Shut Down Sequences.

d. Process Interlocks

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 COMMISSIONING

A. No system or subsystem shall be started-up for continuous operation unless all Goods, including instrumentation and monitoring systems, of that system or subsystem have been tested and proven to be operable as intended by the Contract Documents.

B. The Seller shall place the Goods into operation and perform tests to determine if equipment is operating properly. The purpose of these tests is to verify that both the System and each Unit are:

1. Properly installed

2. Operational

3. Capable of completing an operating cycles free of problems

4. Free from pump or valve cavitation, water hammer, overheating, overloading, vibration, or other operating problems.

5. The Seller shall verify that control programming has been configured with appropriate software time delays to avoid rapid pump or membrane flow cycling in response to transient dynamic hydraulic effects caused by backwash, or chemical washing cycles or other process cycles (e.g. start - up, shut down, membrane test). “Dead-heading” or any operation of any pump under a “zero-flow” or “flow condition below the pump manufacturers acceptable limits” is not acceptable. Interlocks shall be provided to prevent operation of the any pump under a “dead-headed” condition. The pump manufacturers “maximum number of pumps starts per hour” shall not be exceeded.

C. The Seller shall coordinate all activities with the Contractor, Buyer and Engineer. The types of activities to be performed by the Seller will be detailed in the “Detailed Plan of Commissioning Activities” include but not necessarily limited to the following items:

1. Initial Start Up Activities

   a. Verify Unit and Piping Installation

   b. Verify Valve Tags

   c. Verify temporary system interconnections

   d. Verify Instrumentation and Control

      1) Verify Fiber Optic System

      2) Verify PLC Communication

      3) Verify PC or Operator Interface Communication

2. Commissioning Activities

   a. Verify Pumps for Rotation

   b. Commission Compressed Air System

   c. Commission Blower System

   d. Test Modulating Valves

   e. Test Chemical Feed Systems used for feed and backwash

   f. Test Chemical Feed Systems used in Clean-In-Place

   g. Test Level Switches in Tanks

   h. Test Pressure Switches

i. Set Mechanical Seals in Pumps and Flush System

j. Test and Calibrate Process Instruments

1) Flow Meters

2) Pressure Transmitters

3) Level Transmitters

4) Turbidity Meters

5) Chlorine Residual Analyzers

6) pH/ORP Meters

7) Conductivity Meters

8) Temperature Transmitters

k. Miscellaneous Equipment

l. Field Located Manual Valves

m. Field Located Automatic Valves

n. Manual Unit Valves

o. Automatic Unit Valves

p. Flush Piping Systems

3. Start Up Activities

a. Complete Operational Readiness Test (ORT)

b. Feed Flow / Pressure / Level Control System in Manual the Automatic Mode

c. Filtrate Pressure Flow / Pressure / Level Control System in Manual the Automatic Mode

d. Backwash Flow / Pressure Level / Control System in Manual the Automatic Mode

e. Backwash Process Residuals Flow / Pressure Level / Control System in Manual the Automatic Mode

f. Filtration Units Placed into Service in Manual the Automatic Mode

g. Check Start Up Sequence in Normal and Emergency Modes

h. Check Shut Down Sequence in Normal and Emergency Modes

i. Check Process Logic Interlocks

j. Remove Temporary Interconnections

k. Disinfect Piping (if applicable)

l. Install Membrane Modules

m. Place Membrane System in Operation

1) Verify Filtration Sequence

2) Verify Backwash Sequence

3) Verify Membrane Test Sequence

4) Verify Other Seller Process Sequences

n. Chemically Clean Membrane Units

o. Perform Functional Acceptance Test

D. As a part of the commissioning, the Seller shall start-up and operate all support systems provided by or required by the Seller for operation of the system, including but not limited to chemical feed systems, instrumentation, air compression equipment, and electric controls. This testing shall demonstrate that there are no water or air leaks in the System, that the piping has been installed and connected properly, that the electrical system is operating correctly, and that the instrumentation has been properly calibrated.

E. The Seller shall furnish materials (excluding chemicals and power), instruments, and incidental and expendable equipment required for commissioning / placing the equipment into operation. The Seller shall retain the services of any manufacturers representatives as required in the Contract Documents to assist with the commissioning / placing into operation of the Goods. The costs of these services shall be borne by the Seller

F. The Seller shall oversee the installation the membrane modules by the Contractor. The location and serial number of each membrane module shall be provided using a Microsoft Excel Spreadsheet. This information will be used to document Membrane Warranty replacement. Membrane module information shall be collated and submitted to the Buyer as part of the Commissioning Test Reports Manual.

G. Once the membrane modules have been installed, the Seller shall conduct a membrane integrity test on each Unit. The Seller shall provide the Engineer with both the integrity test results for each Unit and results documenting that each installed Unit has passed the integrity test. The Seller shall repair or replace any defective membranes.

H. When requested by the Seller, the Engineer shall review the operation of the equipment to verify that the commissioning is complete.

1. The Engineer shall perform random tests to determine if the equipment is operating properly and witness various operational sequences.

2. Perform and review the results of the Functional Acceptance Test (FAT)

3. The Engineer may initiate alarm conditions to determine if the control system is functioning properly.

4. The Engineers review shall include a review of the HMI interface and PLC SCADA system commissioning requirements

5. The Engineers review shall identify any equipment that has not been properly installed, or operating, detailing the outstanding installation issues on a “punch list” and noting the party who shall be responsible for each correction and identify the items require that correction.

I. Upon satisfactory completion of the review, the Engineer shall submit to the Seller a written “Notice of Completed Commissioning”.

J. Once the “Notice of Completed Commissioning” is issued, Training of Operation and Maintenance Personnel may commence. Refer to Section 01 73 10, Training of Operations and Maintenance Personnel.

END OF SECTION

# SECTION 01 67 00 ACCEPTANCE TESTING OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work: The Seller shall perform an Acceptance Testing of the membrane equipment. Acceptance Testing is subject to the following provisions.

1. Acceptance Testing shall not commence until the Notice of Completed Training is issued in accordance with Section 01 73 10, Training of Operations and Maintenance Personnel.

2. Acceptance Testing shall commence within 7 days after completion of training or at a mutually agreed upon time by the Seller, Buyer, Contractor and Engineer.

3. Acceptance Testing shall extend for a period of 30 consecutive days.

4. Acceptance Testing shall be completed by the Seller within the allocated time identified in the Agreement.

5. Failure to complete the Acceptance Testing as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until Acceptance Testing is complete.

6. The Engineer shall document the time when the facilities are substantially unavailable for use by the Seller to perform Acceptance Testing due to circumstances beyond the control of the Seller including but not limited to power outages, lack of feedwater, inability to transfer product water or feedwater due to factors beyond the control of the Seller, not having adequate staff from the Contractor or the Buyer. If in the sole opinion of the Engineer the facilities are substantially unavailable to the Seller, equivalent additional Acceptance Testing time will be granted.

7. The date that the Acceptance Testing ends shall be used by the Engineer for the date of the membrane equipment “Notice of Substantial Completion”. The “Notice of Substantial Completion” shall be issued by the Engineer upon completion of FINAL Operational and Maintenance Manuals.

B. Reference Specifications

1. Section 01 73 10, Training of Operations and Maintenance Personnel

2. Section 11 30 10, Hollow Fiber Membrane Equipment

C. Coordination

1. The Seller shall coordinate all services and activities required by this Section with the Contractor, Buyer and the Engineer.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) - NOT USED

1.03 SUBMITTALS

A. Upon completion of the Acceptance Testing, the Seller shall submit to the Buyer a written report detailing the results of the Acceptance Testing, including a copy of all field notes and test data.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 ACCEPTANCE TESTING

A. Upon completion of the Operator Training in accordance with the requirements of Section 01 73 10, Training of Operational and Maintenance Personnel, the Seller shall perform an Acceptance Test on the System. Each UNIT shall be tested concurrently but evaluated separately for performance.

B. The purpose of the Acceptance Testing is to demonstrate that equipment is:

1. Properly installed

2. Ready to be placed into service by the Buyer

3. In compliance with the service conditions, performance requirements, material specifications, and all other requirements of the Contract Documents

4. In compliance with the requirements of Instrumentation and Control System Testing (Reliability Acceptance Test, (RAT)).

C. The Seller shall furnish all materials, instruments, and incidental and expendable equipment required for Acceptance Testing, except where otherwise specified.

D. Throughout the Acceptance Testing period, a representative of the Seller shall be present on site during normal working hours and available via means of a pager or cellular communication during non-working hours in case of an emergency.

E. The Buyer or an authorized representative of the Buyer will be present to witness the Acceptance Testing.

F. The Seller shall keep detailed notes regarding the Acceptance Testing and record all test data and results. This will be done through operation of the data logging system. Upon successful completion of the Acceptance Testing, the Seller shall submit a written report on the Acceptance Testing, as specified in Paragraph 1.03.A of this Section.

G. The initial Acceptance Testing period will extend for 30 consecutive days with one or more Unit(s) per train of units operate at the design flow, with the other Units are equally balanced to treat the remaining raw water available for the 30- day period.

H. After the Acceptance Testing is completed, the Engineer and Buyer will meet with the Seller to determine compliance with the Contract Documents. At that time, if it is determined that the Seller has fulfilled the requirements of the Contract Documents, the Seller will be released from its on-site obligation unless otherwise retained.

I. If the Units do not meet the criteria of linear scalability as defined in the Agreement, or if the System does not perform in accordance with the Contract Documents, the Seller shall return or remain on site to perform all necessary corrections at the cost of the Seller until compliance with Contract Documents is demonstrated.

J. During the Acceptance Testing, the System shall perform in accordance with the guaranteed product water quality to allow the Buyer to discharge treated water.

K. If the Acceptance Testing is interrupted at the request of the Seller or by the non-conformance of the Seller's equipment for more than three instances or a cumulative downtime of more than six hours during the acceptance test, the Buyer or Engineer may require that Acceptance Testing be restarted from the beginning, at no cost to the Buyer.

L. Any interruption of the Acceptance Testing caused by circumstances beyond the control of the Seller shall not require the testing to be restarted from the beginning. Such events include any activities that would result in an inadvertent or unplanned shutdown of the PLC / HMI control System or otherwise interfere with the Reliability Acceptance Test. The elapsed time of Acceptance Testing prior to the interruption will be applied to the required testing period.

END OF SECTION

# SECTION 01 68 00 OPERATIONS ASSISTANCE

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. Operation Assistance to the Contractor: The Seller shall provide Operations Assistance to the Contractor for the Membrane Filtration System Equipment.

   a. The Seller shall provide the Contractor with Operational Assistance for the membrane system during times after the “Notice of Completed Commissioning” for the Membrane System has been issued but prior to the completion of Acceptance Testing.

   b. The Seller shall operate the membrane system as required by the Contractor to produce water that will be used for the Commissioning of the remaining facilities.

   c. Prior to the Notice of Substantial Completion, when requested by the Contractor, Operational Assistance shall be provided to the Buyer’s Personnel. Operational Assistance shall be provided for:

      1) Training of the Operations and Maintenance Personnel.

      2) Acceptance Testing.

      3) such times not specifically allocated as part of Training or Acceptance Testing.

   d. Up to 2 weeks of Operational Assistance shall be provided to the Contractor. This Operational assistance is required in addition to any specific requirements associated with Operator Training or Acceptance Testing.

2. Operation Assistance to the Buyer

   a. The Seller shall provide Operations Assistance to the Buyer during the correction period.

      1) Operations assistance shall consist of:

         a) 2 - 16 hour General Operations Assistance visits during the correction period.

         b) One 2-day Seller Training Refresher Course

         c) Seller Services during the Final Inspection

   b. General Operations Assistance shall consist of:

      1) Review of Membrane Filtration Unit Operational Logs

2) Review and Modification of PLC/HMI Programming Software to address system performance issues

3) Review of component equipment operation

4) Assistance to the Buyer's personnel during normal working hours

5) Answer Buyer questions regarding performance of the Membrane System

6) Respond to Warranty notices or claims.

c. Training following two months of regular system operations:

1) The system supplier shall provide 3 days of operation and maintenance training covering system equipment provided.

2) The training course shall be a refresher course covering the Membrane Filtration System.

3) The training course shall be a refresher course covering the PLC control system and HMI stations.

d. Final Inspection Site Visit.

1) The Seller shall attend and participate in the Final Inspection of the Membrane Equipment and respond to items identified by the Seller, Buyer or Engineer as being necessary to fulfill with the requirements of the Contract Documents.

B. Reference Specifications

1. Section 01 73 00, Installation, Operation and Maintenance Manuals

2. Section 01 73 10, Training of Operation and Maintenance Personnel

3. Section 11 30 00, Hollow Fiber Membrane Equipment

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC)

A. Manufacturer's Field Services

1. The representative shall be an employee of the Seller. The Seller shall provide one of the representatives associated with the Commissioning, Training and Acceptance Testing of the Membrane Pretreatment System.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 MANUFACTURERS FIELD SERVICES

A. The Seller's Project Manager shall participate in the Final Inspection to resolve any outstanding issues. The Seller shall correct any items identified by the Buyer or the Engineer during final inspection and resolve said items prior to the issuance of the Notice of Acceptability by the Engineer.

END OF SECTION

# SECTION 01 73 00 INSTALLATION, OPERATION AND MAINTENANCE MANUALS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. Provide INSTALLATION, PRELIMINARY and FINAL Operational and Maintenance (O&M) Manuals for use by the Contractor and the Buyer.

a. The term "Operation and Maintenance Manual" includes all product related information and documents which are required for preparation of the Membrane Filtration System O&M Manual, and data that is required for inclusion by current regulations of any participating government agency or as a provision of a membrane system warranty.

b. Failure to provide the INSTALLATION, PRELIMINARY and FINAL Operational and Maintenance (O&M) Manuals as required by this Section within the allocated time shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until Manuals have been received. Required Delivery for O&M Manuals are as follows:

1) INSTALLATION Manuals are due 30 days before the Goods are delivered to the Point of Destination.

2) PRELIMINARY O&M Manuals are due 30 days before Commissioning.

3) FINAL O&M Manuals are due 30 days after the completion of Acceptance Testing.

c. The term component equipment supplier is used to describe a manufacturer’s Goods purchased by the Seller and incorporated into the Membrane Filtration System.

d. The O&M Manual shall include, but not be limited to, the following:

1) Equipment function, operating characteristics, limiting conditions, operating instructions and procedures for startup, normal and emergency conditions, shutdown and storage

2) Safety considerations relating to installation, operation and maintenance procedures

3) Installation procedures

4) Calibration procedures

5) Routine and preventive maintenance instructions

6) Procedures for disassembly, reassembly, alignment, adjustment, and inspection instructions

7) Recommended spare parts list to maintain equipment in service

8) Special Tools:

   a) For Seller equipment, provide list of special tools included and required for installation checking, testing, parts replacement, and maintenance

   b) For component equipment, a list of special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance with current price information

9) For component equipment provide name, address and telephone number for local sources of equipment and/or replacement parts

10) Operational log sheets and maintenance schedules

11) Material Safety Data Sheets (MSDSs) for any applicable item (chemicals, oils, lubricants, etc) provided by the Seller

12) Furnish lubricants of the type and grade necessary to meet the requirements of the equipment. Provide lubricants that are NSF Standard 61 approved as food grade and that are compatible for use in public water supplies

13) Warranty Information, Bond(s), and Service contract(s), if applicable

14) Equipment Specific and Factory Test Report information shall include:

   a) Tag name, Model and Serial number of the equipment provided

   b) Name, address, and phone number of manufacturer, manufacturer's local service representative

   c) Factory Test Reports where applicable

   d) Approved Shop Drawings (including equipment drawings, schematics, circuit diagrams)

e. Routine and preventive maintenance instructions include all information and instructions required to keep equipment properly lubricated, adjusted, and maintained so that the item functions as intended throughout its full design life. Routine and preventive maintenance instructions shall include, but not be limited to, the following:

   1) Written explanations with illustrations for each preventive maintenance task

   2) Recommended schedule for execution of preventive maintenance tasks

   3) Lubrication charts shall include a table of alternative lubricants naming at least two alternate lubricant manufacturers, with applicable product numbers, for each application

   4) Troubleshooting instructions

5) List of required maintenance tools and equipment

B. Reference Specifications

1. Division 11, Equipment

C. Coordination

1. The Seller shall coordinate the delivery and incorporation of O&M Manuals prepared for this project by the Seller or provided from their component equipment suppliers. The Seller shall develop an O&M Manual for the equipment and systems designed and provided by the Seller under this contract.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC) – (NOT USED)

1.03 SUBMITTALS

A. General

1. Installation, Commissioning, Training of any process, or piece of equipment shall not be permitted until the respective INSTALLATION or PRELIMINARY manuals have been received and approved by the Engineer as being sufficient in content to allow the completion of the work.

2. O&M Manuals shall be submitted in three ring binders with a table of contents and index tabs to identify the various items.

3. The table of contents shall reference the applicable specification section(s) for each item and shall be included in each volume of multi-volume manuals.

4. O&M manuals shall use dividers and indexed tabs between major categories of information such as Operating Instructions, Preventive Maintenance Instructions, etc.

5. O&M manuals shall use 8-1/2-inch by 11-inch acid free paper of high rag content and quality. All text must be legible, type-written or machine printed originals or high quality copies.

6. Each page shall have a binding margin of approximately 1-1/2 inches and be punched for placement in a three-ring " D" style loose-leaf binder, which shall be provided by the Seller along with the submittal. Each binder shall be no more than 3 inches.

7. Drawings: Provide full size blueprints (24 x 36) and Half-size black line (11 x 17) reproductions shall be provided for all project drawings. 11-inch x 17- inch drawings shall be bound in a separate binder. 11-inch x 17-inch drawings shall not be folded and placed in any project binder designed for 8½ inch x 11 inch pages.

8. Electronic File Format for CD

a. All Seller O&M Manual information shall be supplied to the Buyer as electronic file format that it was originally developed and in condensed portable document format (.PDF format). The specifications for PDF generation are as follows:

1) The acceptable format is Portable Document Format (PDF): Adobe Acrobat or Adobe Acrobat Exchange

2) The initial filename for the EOM submittal is provided with the request for final O&M manuals. The filename is posted near the top of the review form. Filenames use the “eight dot three” convention (XXXXX_YY.PDF) where XXXXX is the specification section number and YY is an ID number. If technical problems require you to break the submittal into more than one file then add a letter extension to the end of each filename. (example: 19876_01A.PDF) Keep the number of files to a minimum.

3) Scan images at a resolution of 400 dpi or greater. Perform Optical Character Recognition (OCR) capture on all images. Achieve OCR with the “original image with hidden text” option (as seen in Adobe Acrobat Exchange 4.05).

4) Create one PDF document (PDF file) for each equipment O&M Manual. The entire manual is converted to a single PDF file via scanning or other method of conversion. Drawing or other graphics must be converted to PDF format and made part of the one PDF document. Rotate pages that must be viewed in landscape to the appropriate position for easy reading. Word searches of the PDF document must operate successfully. (proof of OCR)

5) Create a bookmark in the navigation frame, for each entry in the Table of contents. Three levels deep is usually enough (i.e. Chapter, Section, Sub-section)

6) Generate thumbnails for each completed PDF file.

7) Set the opening view for PDF files as follows:

a) Initial view: Bookmarks and page

b) Magnification: Fit in window

c) Open to the cover page of the manual, with bookmarks to the left, and the first bookmark linked to the table of contents.

b. All component equipment manuals shall be provided in .PDF format.

c. All Project drawings shall be provided in AutoCAD 2000 and .PDF format.

9. Equipment Identification

a. Identify products and components by their Tag and descriptive names. The use of cryptic model or catalog numbers or letters for identifica- tion shall not be acceptable.

b. Indicate all components of the equipment on catalog pages by bold markings or some other clearly definable medium for ease of identification. All markings shall be readable if photocopied.

B. Letter of Transmittal:

a. The Seller shall provide a Letter of Transmittal with each submittal and include the following in the letter:

b. Date of submittal.

c. Contract title and number.

d. Seller's name and address.

e. A list of the attachments and the Sections of the Manual to which they relate.

f. Reference to or explanation of related submittals already made or to be made at a future date.

C. The Seller shall prepare INSTALLATION Manuals for the Installation of the Goods by the Contractor.

1. The Seller shall submit six copies marked "INSTALLATION" of each required O&M manual to the Contractor. Each manual shall include a CD containing the information contained in the manual. Distribution by Contractor shall be as follows:

a. The Contactor shall retain 3 copies

b. The Engineer shall receive 2 copies

c. The Buyer shall receive 1 copy

2. The Seller shall organize the "INSTALLATION" manuals as follows

a. Seller Equipment Installation Manual

1) Seller Equipment Installation Instructions

2) Contractor Training Information

3) Painting Touch up and Repair Instructions

4) Equipment Cross-Reference Schedules

a) For all tagged devices supplied, the Seller shall develop an "Cross Reference Schedule" that matches the Tag to the appropriate equipment manual. The equipment schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range. The equipment cross-reference schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

b. Component Equipment O&M Manuals

1) Includes all Division 5, Division 11, (excluding membrane equipment) and Division 15 approved or "as constructed by Seller" shop drawing submittals and equipment Installation, Operational and Maintenance Manuals.

c. Instrumentation and Control Equipment Manuals

1) Includes all Division 13 approved or “as constructed by Seller” Shop Drawing Submittals and Equipment Installation Operational and Maintenance Manuals.

d. Electrical Equipment Manuals

1) Includes all Division 16 approved or “as constructed by Seller” Shop Drawing Submittals and Equipment Installation, Operational and Maintenance Manuals.

e. All “As Constructed” Project Drawings

D. PRELIMINARY O&M Manual:

1. The Seller shall submit six copies marked “PRELIMINARY” of each required O&M manual and the training plan. Each manual shall include a CD containing the information contained in the manual.

2. The Seller shall organize the PRELIMINARY O&M Manuals as follows:

a. Seller Equipment O&M Manual

1) Includes O&M and Preventive Maintenance Instructions

2) Includes Detailed Plan of Commissioning Activities

3) Includes the Equipment Cross-Reference Schedule

b. Component O&M Manuals

1) Includes all Division 5, Division 11, (excluding membrane equipment) and Division 15 approved or “ as constructed by Seller” equipment Installation, Operational and Maintenance Manuals.

c. Instrumentation and Control O&M Manuals

d. Electrical Equipment Manuals

e. Equipment Specific and Factory Test Reports Manual

f. Seller and Component Equipment Suppliers Training Manual(s)

g. All “As Constructed” Project Drawings

E. After the Acceptance Testing has been completed the Seller shall revise and resubmit the FINAL O&M Manuals for the project. Eight final copies of each of the required Operation and Maintenance Manuals shall be submitted. Each manual shall contain a CD containing the information contained in the manual.

1. FINAL O&M Manual(s):

2. The Seller shall submit six copies marked “FINAL” of each required O&M Manual. Each manual shall include a CD containing the information contained in the manual.

    a. The Seller shall organize the FINAL O&M Manuals as follows:

        1) Seller Equipment O&M Manual

        2) This O&M Manual will be provided “as new in its entirety.”

        3) Includes O&M and Preventive Maintenance Instructions

        4) Includes an equipment cross-reference schedule

        5) Includes a FINAL CD

    b. Component O&M Manuals

        1) This Manual will include only changes from the PRELIMINARY to FINAL Versions. The Seller shall provide new Manual Covers or Binders

        2) Includes a FINAL CD

    c. Instrumentation and Control O&M Manuals

        1) The Seller PLC/HMI Manuals will be provided “as new in its entirety.”

        2) The component equipment manuals include only changes from the PRELIMINARY to FINAL Versions. The Seller shall provide new Manual Covers or Binders

        3) Includes a FINAL CD.

    d. Electrical Equipment Manuals

        1) The Electrical Equipment Manuals include only changes from the PRELIMINARY to FINAL Versions. The Seller shall provide new Manual Covers or Binders

        2) Includes all Electrical, Shop Drawing Submittals and Component Equipment O&M Manuals

        3) Includes a FINAL CD

    e. Equipment Specific and Factory Test Reports Manual

        1) The FINAL Factory Test Report Manual shall include only changes from the PRELIMINARY to FINAL Versions for Component Equipment. The Seller shall provide new Manual Covers or Binders.

    f. Commissioning Test Reports Manual shall include:

        1) Results of all installation inspection, field calibration, and field testing reports prepared during the commissioning of the facility

2) Results of membrane module installation and integrity testing

3) Results of Acceptance Testing

g. All “as installed” project drawings will be provided “as new in its entirety” and include a FINAL CD.

**PART 2 -- PRODUCTS - NOT USED**

**PART 3 -- EXECUTION - NOT USED**

END OF SECTION

# SECTION 01 73 10 TRAINING OF OPERATIONS AND MAINTENANCE PERSONNEL

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work

1. The Seller shall provide formal training of the Buyers' personnel. Training shall commence after the "Notice of Completed Commissioning" is issued.

   a. Training of the Buyer's personnel shall commence within a period of 14 days after the "Notice of Completed Commissioning" has been issued as mutually agreed to by the Buyer, Engineer, Contractor and Seller.

   b. Training shall be conducted for first shift during normal working hours.

   c. Training shall be completed within the time allocated in the Agreement.

   d. The Engineer shall document the time when the facilities are substantially unavailable for use by the Seller to perform training due to circumstances beyond the control of the Seller including but not limited to power outages, lack of feedwater, inability to transfer product water or feedwater due to factors beyond the control of the Seller, not having adequate staff from the Contractor or the Buyer. If in the sole opinion of the Engineer the facilities are substantially unavailable to the Seller, equivalent additional time for training will be granted.

   e. Failure of the Seller to complete the Training as required by this Section within the allocated time, shall constitute a failure of the Seller to provide Special Services in accordance with the requirements of the Contract. The Seller shall be assessed Liquidated Damages in accordance with Article 5 of the Agreement until Training is complete.

   f. Upon successful completion of the Training required by this Section, the Engineer will issue a "Notice of Completed Training".

   g. The Seller shall maintain record of the individuals that have completed training and provide information required for the documentation of Professional Development Hours required for the Buyer's personnel.

2. The Seller shall provide the services of factory-trained specialists to train the Buyer's personnel in the recommended operation and the preventive maintenance procedures for all equipment provided by the Contract Documents.

3. The Seller shall provide a combination of classroom and hands-on training. All training shall be conducted at the Buyer's location.

4. The following Levels of Training Shall Be Provided.

| Level of Training | Number of Shifts | Maximum Number of Participants | Classroom Training (Hours) | Hands-On Training (Hours) |
|---|---|---|---|---|
| Membrane System | 1 | 8 | 8 | 16 |
| Mechanical Equipment | 1 | 8 | 8 | 16 |
| Instrumentation and Control Equipment | 1 | 4 | 8 | 16 |
| PLC / HMI | 1 | 4 | 16 | 16 |

5. Hands-On Training shall be limited to groups of 8. In the event that more than 8 personnel are to be trained, multiple hands-on training sessions shall be conducted.

6. The Seller shall be responsible for all costs associated with training and shall provide required materials, texts, and supplies.

7. Training shall be conducted in normal eight (8) hour working days until conclusion of the training course.

8. Training sessions may be video recorded by the Buyer at the Buyer's expense.

9. Training material shall be provided to the Buyer in written and electronic format.

10. Training shall be performed by the Seller and component equipment suppliers. The Seller shall be responsible for the training on the design and operation of the equipment and systems provided. This includes:

    a. Membrane System

        1) Membrane Filtration Theory

        2) Membrane Filtration System

        3) Membrane Filtration Units

        4) Membrane Filtration Processes

            a) Start Up, Shut Down

            b) Filtration, Backwashing

            c) Maintenance Cleaning, Chemical Washing, Backwash and Clean in Place

d) Integrity Testing and Module Repair

5) Routine and Non-Routine Maintenance

b. Component Equipment Training

1) Equipment, Equipment (including pumps, compressors)

2) Mechanical, Equipment (valves, actuators, and positioners)

c. Instrumentation and Control Component Equipment Training

1) Switches

2) Meters and Transmitters

3) Analyzers

d. Instrumentation and Control Process Logic Control/HMI Training

1) Process Logic Control Equipment

2) HMI System Training

11. Component Equipment Suppliers: The Seller shall retain the services of manufacturer's representative(s) for training of the following equipment provided by the Seller.

a. Pumps

b. Compressors

c. Process Logic Control Equipment

d. HMI System Programming

e. Other equipment provided by the Seller where the Seller is not qualified to provide authorized factory level training

B. Reference Specifications

1. Section 01 66 00, Commissioning of Membrane Equipment

2. Section 01 67 00, Acceptance Testing

3. Section 01 73 00, Installation, Operation and Maintenance Manuals

4. Section 11 21 10, Horizontal End Suction Pumps

5. Section 11 30 00, Hollow Fiber Membrane Equipment

C. Coordination:

1. The Seller shall coordinate these services at times acceptable to the Buyer, with a minimum of 5 days prior notice.

1.02 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC)

1. The qualifications of specialists shall meet the requirements of this Section and are subject to approval by the Engineer.

1.03 SUBMITTALS

A. Training Manuals shall be provided with the PRELIMINARY O&M Manuals. Refer to Section 01 73 00, Installation, Operation and Maintenance Manuals.

B. The Seller shall develop and submit to the Engineer and Buyer a Training Manual. The Training Manual Plan shall include the elements presented in this Section or as required by the Seller or component equipment supplier.

C. The Seller shall prepare a Training Lesson Plan, provide qualified instructors, and schedule the training in an organized manner.

1. Proposed lesson plans for scheduled instruction shall be submitted 15 days prior to the commencement of training. Lesson plans shall be approved by the Engineer a minimum of 5 days prior to scheduled instruction. All training material shall be provided to the Buyer in electronic format.

2. Credentials for the Seller’s designated instructor(s) shall be submitted thirty (30) days prior to the commencement of training. Credentials shall include a brief resume and specific details of the instructor(s) pertaining both to personal experience operating and maintaining the specified equipment and conducting operation and maintenance for the same equipment.

3. The Seller’s proposed lesson plans shall detail specific instruction topics. Training aids to be utilized in the instruction shall be referenced and attached where applicable to the proposed lesson plan. "Hands-on" demonstrations planned for the instruction shall be described in the lesson plan.

4. The Seller shall indicate the estimated duration of each segment of the training in the lesson plan.

5. Submit information as required by the local primacy agency in support of Professional Development Hours.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING (NOT USED)

1.05 SPECIAL PROJECT CONSIDERATIONS

A. Training Aids

1. The Seller’s instructor shall incorporate training aids as appropriate to assist in the instruction. As a minimum, the training aids shall include text and figure handouts. Texts shall be bound within three-ring binders. Other appropriate training aids are:

a. Audio-visual aids (e.g., films, slides, videotapes, overhead transparencies, posters, blueprints, diagrams, catalogue sheets)

b. Equipment cutaways and samples (e.g., spare parts and damaged equipment)

c. Tools (e.g., repair tools, customized tools, measuring and calibrating instruments)

2. The Seller's instructor shall utilize descriptive class handouts during the instruction. Photocopied class handouts shall be good quality reproductions. Class handouts should accompany the instruction with frequent reference made to them. Customized handouts developed especially for the instruction are required. Handouts planned for the instruction shall be attached with the manufacturer's proposed lesson plan.

B. "Hands-On Demonstration"

1. The Seller's instructor shall present "hands-on" demonstrations of operations and maintenance of the Seller supplied and component equipment. The proposed "hands-on" demonstrations should be described in the Seller's proposed lesson plan.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.01 OPERATOR TRAINING

A. Training: The instruction lesson plan shall include the following as a minimum:

1. Equipment Operation:

a. Describe equipment's operating (process) function

b. Describe equipment's fundamental operating principals and dynamics

c. Identify equipment's mechanical, electrical, and electronic components and features

d. Identify all support equipment associated with the operation of subject equipment (e.g., compressed air intake filters, valve actuators, motors)

e. Recommend standard operating procedures to address start-up, routine monitoring, and shut-down of the equipment

2. Detailed Component Description:

a. Identify and describe in detail each component's function

b. Group related components into subsystems, where applicable. Describe subsystem functions and their interaction with other subsystems

c. Identify and describe in detail equipment safeties and control interlocks

3. Equipment Preventive Maintenance (PM):

   a. Describe PM inspection procedures required to:

      1) Perform an inspection of the equipment in operation

      2) Spot potential trouble symptoms and anticipate breakdowns

      3) Forecast maintenance requirements (predictive maintenance)

   b. Define the recommended PM intervals for each component

   c. Provide lubricant and replacement part recommendations and limitations

   d. Describe appropriate cleaning practices and recommend intervals

   e. Identify and describe the use of special tools required for maintenance of the equipment

   f. Describe component removal/installation and disassembly/assembly procedures

   g. Perform "hands-on" demonstrations of preventive maintenance procedures

   h. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate

   i. Define recommended torquing, mounting, calibration, and/or alignment procedures and settings, as appropriate

   j. Describe recommended procedures to check/test equipment following a corrective repair.

4. Equipment Troubleshooting

   a. Define recommended systematic troubleshooting procedures

   b. Provide component specific troubleshooting checklists

   c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting

END OF SECTION

# SECTION 01 74 00 MEMBRANE SYSTEM AND MODULE WARRANTY

## PART 1 -- GENERAL

### 1.01 SUMMARY

A. Section includes:

1. Membrane system and module warranty information.

2. This section covers the membrane system equipment and module warranty. This section addresses the requirements in conjunction with the provisions of Paragraphs 9.01, 9.03 and 9.04 of the General Conditions.

B. Related specification sections include but are not necessarily limited to:

1. Division 00, Procurement and Contracting Requirements.

2. Division 01, General Requirements.

3. Section 11 30 00, Hollow Fiber Membrane Equipment

### 1.02 QUALITY ASSURANCE

A. Referenced standards:

1. ASTM International:

a. D6908, Standard Practice for Integrity Testing of Water Filtration Membrane Systems.

B. Seller's Quality Assurance/Quality Control (QA/QC) Procedures

1. Submit for approval, prior to the shipment of the membrane modules, reports in letter format for each membrane module. At a minimum, the reports shall include:

a. The membrane module model and part number, manufacturing lot number and serial number. Indicate the nominal and absolute pore size, inside and outside fiber diameter, effective fiber length, and effective feed side surface area of the membrane module.

b. The membrane module normalized specific flux (permeability, gfd/psi at 20°C).

c. A certification by the membrane module supplier that:

1) Each membrane module has passed the Seller's QA/QC (integrity) tests.

d. Certification of wet testing for each membrane module conducted at the Seller's facilities. Seller shall certify that each membrane module has passed the QA/QC tests for membrane element integrity. Acceptable QA/QC tests include bubble point or pressure hold tests above the minimum value recommended by the Seller and approved by the Engineer.

e. Identify modules that have undergone pinning or repair for more than 0.1 percent of original fibers at the factory.

2. Certificates of Warranty

a. Submit a listing of chemical constituents, concentrations and exposure times that would void the membrane warranty.

1.03 DEFINITIONS

A. Log Reduction Value (LRV): The filtration removal efficiency expressed as $\log_{10}$ for a target organism or surrogate.

B. Membrane Module(s): Hollow fiber membranes arranged as a module that is a sub-assembly of a MF/UF Unit.

C. Membrane Integrity Failure Occurrence:

1. A loss of integrity (e.g., partial or complete fiber breaks) that results in less than 4-log (LRV of 4 or 99.99 percent filtration efficiency for a removal of 3 micron or larger particles) as determined by an air pressure based Direct Integrity Test such as the:

a. Pressure Decay Test.

b. Diffusive Airflow Test.

c. Correlated Airflow Measurement Test:

1) A pressure decay test, applying Hagen-Poisseville equation per ASTM D6908.

d. Other conforming integrity tests that satisfy the criteria for test resolution and sensitivity as described by any recognized independent method developed by a consortium of membrane module manufacturers or described and accepted as a method by the primacy agency.

2. MF/UF System: The complete MF/UF System is comprised of multiple MF/UF Units and all ancillary equipment.

D. MF/UF Unit(s): One (1) complete filtration unit including valves, pumps, controls, and piping capable of producing filtered water.

E. Substantial Completion: See Division 0, General Conditions.

1.04 SUBMITTALS

A. Shop Drawings

1. Membrane Warranty

    a. Submit design calculations to substantiate the 4-Log Membrane LRVs for air pressure integrity testing. Perform calculations based upon a broken fiber·lumen(s) or a microporous defect of 3 microns to determine the worst-case membrane integrity defect scenario.

    b. Provide a listing of chemical constituents, concentrations and exposure times that would result in voiding the membrane warranty.

    c. For each of the above chemical constituents, identify the instrumentation required and alarm limits necessary to satisfy the warranty provisions of this section.

2. MF Membrane Modules:

    a. Include module construction details.

        1) Materials of construction.

        2) Dimensions.

        3) Standard commercial part numbers and materials for elastomeric seals. Note that Buna-N seals are not acceptable.

    b. Include standard performance parameters.

        1) Operating temperature.

        2) pH and oxidant tolerance (continuous and intermittent).

        3) Range of membrane flux.

        4) Clean water normalized specific flux (permeability or resistivity).

        5) Minimum bubble point or maximum pressure decay test parameters.

    c. Include storage and handling requirements.

    d. Provide standard operating and maintenance data including storage solutions (concentration and volume) used during shipment and recommended rinsing solutions (concentration and volume) and long-term/short-term storage protocols.

B. Factory Test Reports

1. Prior to delivery of the membrane modules, submit the following:

    a. Seller shall identify each membrane module by a unique serial number and indicate the membrane lot.

    b. Seller shall provide the membrane specification sheets that specify each membrane module's normalized specific flux (gfd/psi at 20°C), nominal pore size, and the nominal inside and outside surface area of the filter module.

c. Certification of wet testing for each membrane module conducted at the Seller's facilities. Seller shall certify that each membrane module has passed the QA/QC tests for membrane element integrity. Acceptable QA/QC tests include bubble point or pressure hold tests above the minimum value recommended by the membrane module supplier and as approved by the Engineer.

C. Certificates of Warranty

1. The listing of chemical constituents, concentrations, and exposure time that would void the membrane warranty.

1.05 MEMBRANE SYSTEM WARRANTY

A. During the Correction Period, the Seller shall furnish an equipment warranty certificate assuring the containerized membrane filtration units and system (including membrane modules) will meet the service conditions specified in Section 11 30 00, Hollow Fiber Membrane Equipment, Paragraph 2.01.

B. Seller warrants satisfactory performance of the Goods to achieve equipment performance (e.g., design flows, water recovery, backwash, chemical washing, and Clean-In-Place (CIP) intervals) and water quality (e.g., integrity failure) objectives and complies with the concept of linear scalability as defined in the Agreement.

C. In the event that the Buyer does not believe that the Goods meet the specifications, including the criteria of linear scalability, the Buyer shall notify the Seller that the conditions for a breach of contract exist. Seller shall provide at no cost to the Buyer pilot equipment of the type and kind evaluated during the pilot testing, if not available to the Buyer, to verify the compliance with the specifications. In the event that the Buyer determines that the equipment does not comply with the specifications including the concept of linear scalability, the Seller shall provide an acceptable remedy to the Buyer in accordance with the General Conditions. If an acceptable remedy is not obtained, the Buyer shall notify the Seller that a breach of contract exists.

D. If the Goods are non-conforming and unable to conform to the equipment performance objectives for criteria other than linear scalability, the Buyer will notify the Seller in accordance with the procedures identified in Paragraph 9.03 of the General Conditions. Buyer shall make available to the Seller electronic records for Seller review. Seller shall be given 10 days to develop a plan to remedy the non-conformance.

E. If within 60 days after the notification to the Seller it has become apparent to the Buyer that the remedy is not acceptable, the Buyer will provide notice to the Seller that the conditions for breach of contract exist. If within 30 days an acceptable remedy is not obtained, the Buyer shall notify the Seller that a breach of contract exists.

F. Buyer recognizes that to remedy system warranty provisions, the Seller may need to modify operational protocols. Seller recognizes that any change to the operational protocols must be acceptable to the Buyer. Buyer recognizes that any changes to operational protocols by the Seller pursuant to this warranty provision are acceptable under the following conditions:

1. That the specified design parameters (e.g., production capacity, water quality, system recovery, and chemical cleaning interval) are obtained.

2. That the change in operational parameters and protocols (e.g., backwash, chemical washing, or chemical cleaning) will not represent an increase in operational or membrane replacement costs to the Buyer.

1.06 MEMBRANE MODULE WARRANTY

A. General:

1. Seller warrants that the membrane modules will be used for the treatment of water for drinking purposes and that in accordance with Paragraph 5.08 of the General Conditions the membrane modules are fit for the intended purpose.

2. Membrane modules and elements purchased by the Buyer or otherwise provided under the Agreement or as a future membrane replacement shall be provided with the same warranty as the membrane modules and elements provided as part of the original equipment installation.

3. Seller warrants that the membrane modules and elements will be free from non-conformance in:

a. Materials.

b. Workmanship.

c. Membrane integrity failure.

d. Irreversible flux loss.

B. Membrane Module and Element Warranty Periods

1. Seller shall warrant the performance of the supplied MF/UF membrane modules for a period of not less than ten (10) years (inclusive of the three (3) years full replacement warranty period) from the date of Substantial Completion.

a. The warranty shall guarantee the performance of the membrane modules so as to meet the MF/UF system design and performance criteria specified in Section 11 30 00, Hollow Fiber Membrane Equipment.

b. Membrane modules that within the first year become non-conforming, as defined by the requirements specified herein, must be replaced with new membrane modules at no cost to the Buyer.

2. Seller’s membrane module and element warranty periods have been established in the Proposal.

a. Seller’s membrane module warranty period shall commence with the date of Substantial Completion and continue until the end of the pro-rata warranty period submitted by the Seller with the Bid.

b. The membrane module and element warranty periods shall consist of two (2) parts: a full replacement warranty period and a pro-rata warranty period.

1) The full replacement warranty period shall last for a period of at least three (3) years after the date of Substantial Completion as described below:

   a) For membrane modules or elements supplied as part of the original equipment installation, the date of Substantial Completion is when the full replacement warranty period commences.

   b) For membrane modules or elements provided after the start of Substantial Completion, the full replacement warranty period begins the date the membrane module or element is placed into service.

   c) Buyer shall record and maintain records of the date of installation for all membrane modules and elements.

2) The pro-rata warranty period of seven (7) years shall commence with the end of the full replacement warranty period and last until the end of the pro-rata warranty period as submitted by the Seller in the Bid.

C. In the event that the Goods do not meet the performance requirements specified, including the criteria of linear scalability, the Buyer shall notify the Seller in writing requesting warranty replacement modules.

   1. Following return notification, the Seller shall have an optional 10-day period to provide on-site troubleshooting and/or repair of the defective Goods.

D. In the event that the capacity or quality cannot be regained through these efforts, an adequate number of modules will be replaced as per the terms of the warranty to recover system performance within the parameters specified in Section 11 30 00, Hollow Fiber Membrane Equipment.

E. If within 60 days after the notification to the Seller it has become apparent to the Buyer that the remedy is not acceptable, the Buyer will provide notice to the Seller that the conditions for breach of contract exist.

   1. If within 30 days following such notice an acceptable remedy is not obtained, the Buyer shall notify the Seller that a breach of contract exists.

F. Buyer recognizes that to remedy system warranty provisions, the Seller may need to modify operational protocols.

   1. Seller recognizes that any changes to the operational protocols must be acceptable to the Buyer.

   2. Buyer recognizes that any changes to operational protocols by the Seller pursuant to this warranty provision are acceptable under the following conditions:

      a. That the specified design parameters (e.g., production capacity, water quality and system recovery) are obtained.

      b. That the change in operational parameters and protocols (e.g., backwash, chemical cleaning, or recovery cleaning) will not represent an increase in operational or membrane replacement costs to the Buyer.

c. Revised protocol is subject to review and approval by the Buyer and/or Engineer.

G. Limitation of Membrane Module and Element Warranty

1. Buyer recognizes that the occurrence of any of the following shall void the membrane module and element warranties:

a. Physical damage or faulty installation of the membrane modules or elements by anyone other than Contractor, Seller, or Seller's authorized representative.

b. Unauthorized alteration of components manufactured by the Seller.

c. Catastrophic exposure to chemicals or deleterious substances not normally associated with water treatment as a result of accidents, vandalism or other acts that are outside the bounds of routine and normal water treatment plant operations.

d. Use of water treatment chemicals, chemical cleaning solutions or cleaning procedures other than chemicals, solutions and procedures approved by the Seller.

e. Exposure of the membrane modules or elements to treated water or water treatment chemicals at concentrations above levels or contact times acceptable to the Seller.

1) Seller is responsible for providing the Buyer a listing of the known water treatment and cleaning chemicals and concentrations and times of exposure that could result in membrane damage.

2) Operation or cleaning of any membrane module or element outside the stated chemical limits shall void the remaining portion of the membrane module or element warranty.

f. Improper maintenance of equipment, as defined in the Technical/O&M Manual.

g. Failure of the Buyer to maintain operational logs as required by the Seller.

1) The maintenance of electronic logs is subject to the following conditions:

a) Seller is responsible for providing the Buyer a listing of the operational data points that are to be electronically logged.

b) Seller is responsible for the control programming of data points that are to be electronically logged.

c) Seller shall identify minimum frequencies of logging of all operational data points required by the Seller to maintain membrane module and element warranty provisions.

d) Seller shall establish the alarm and shutdown limits that would result in the operation of the equipment outside of Seller acceptable limits.

e) Seller shall be solely responsible for the identification and programming of system interlocks that would result in the operation of the system outside of the parameters required by the Seller.

(a) Buyer will not be responsible for errors in Seller developed programming that would result in improper operation of the system.

h. In the event of a warranty claim, failure of the Buyer to provide the Seller with operational logs.

2. Buyer will assume responsibility of maintaining a hand-written log if an occurrence develops that is totally outside the bounds of routine and normal operation or automated operation.

a. Such items would include obtaining water analyses, or catastrophic events (e.g., discharges of foreign objects or chemicals that are outside the normal operation of a water treatment facility).

3. Changes in the Seller established operational and maintenance guidelines cannot be applied retroactively to invalidate the membrane module or element warranties.

4. Seller is solely responsible for the identification of water quality parameters normally associated with water treatment and water treatment chemicals and cleaning solutions (for procedures approved by the Seller), and for identification of instrumentation and control programming required to satisfy and maintain membrane module and element warranty provisions for operation and cleaning.

5. Buyer recognizes that to satisfy warranty requirements, the Seller may provide membrane replacement modules or elements that embody changes in module or element design and construction features.

a. Buyer recognizes that the replacement of membrane modules or elements pursuant to this warranty with a different membrane module or element is acceptable under the following conditions:

1) That the specified design and operational parameters (e.g., design flows, water quality, system recovery and chemical cleaning intervals) are obtained.

2) That the change in membrane modules or elements will not represent an increase in the operational or membrane module or element replacement costs to the Buyer.

3) The revised module or element must also be in compliance with regulatory requirements.

H. Membrane Module and Element Pricing

1. Seller shall establish the membrane module and element prices (as indicated in the Proposal Pricing Form) and guarantees that:

a. Membrane modules and elements have been provided to the Buyer at prices not exceeding the prevailing market price.

b. In the Proposal Pricing Form, the Seller shall indicate the cost escalated Consumer Price Index (CPI) used to calculate the replacement price.

1) The CPI adjustment is the most recent Month CPI Index divided by the CPI Index for the month of the Bid submittal.

c. The CPI Index to be used shall be the "CPI-U, US City Average, all Items (non-seasonally adjusted)" as compiled by the U.S. Department of Labor.

2. During the full replacement warranty period, the Seller shall provide replacement modules and elements for non-conforming modules and elements at no cost to the Buyer.

3. Module and element prices during the pro-rata warranty period shall be calculated as follows:

a. Pro Rata Module Price = (Module Price x applicable CPI adjustment x Months of Beneficial Use)/Membrane Module Pro-Rata Warranty Period (Months).

I. Membrane Module Integrity:

1. Membrane Integrity Test Frequency:

a. Membrane Integrity testing shall be performed daily.

2. LRV Determination

a. The operating Log Reduction Value (LRV) shall be determined at the maximum design flux and maximum Transmembrane Pressure (TMP), if calculated using the test result on an intermittent basis.

b. The LRV shall be determined at the operating flux and TMP, if calculated using the test result on a continuous basis using the result of the last direct integrity test.

c. The LRV calculation shall include the applicable adjustment for the "concentration factor" as described in the Direct Integrity Test provisions of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

d. If empirical data is used for the calculation of LRV, the Seller will provide adequate evidence (e.g., results of challenge testing at the Seller membrane integrity test pressure, air and water flow/pressure drop data) to support the correlation between air pressure integrity test result and LRV based upon a "flow limiting orifice" criteria for a broken lumen at the membrane - membrane pot interface for approval by the Engineer.

3. Membrane Integrity Failure

a. Membrane modules shall be considered to have non-conforming integrity failure if the number of Membrane Integrity Failure Occurrences per membrane unit exceeds three (3) occurrences in a three (3) month period or six (6) occurrences in a 12 month period.

1) Seller will define the number of fiber breaks per Unit that constitutes Membrane Integrity Failure Occurrence for their particular membrane module.

b. If a Membrane Integrity Failure Occurrence is identified:

1) Module(s) may be isolated from service and the system retested. If isolation of the modules(s) restores Unit integrity requirements, the Unit may be placed back into service.

2) The individual modules shall be pin repaired, or replaced if pin repair is not possible, and the Unit will be retested and returned to service. The membrane module serial number and number of membrane fibers repaired shall be recorded. The Membrane Integrity Failure Occurrence shall be documented by the Buyer.

3) For subsequent Membrane Integrity Failure Occurrences, module(s) may be isolated from service and the Unit placed back into service unless the cumulative area isolated from the Unit reduces the MF/UF System Firm Capacity below that which is required.

4) If module(s) cannot be isolated from service, then all defects in that Unit shall be repaired or replaced (if repair is not possible), and the Unit retested and placed back into service.

5) The membrane module serial number and number of membrane fibers repaired shall be recorded.

c. Individual membrane module(s) shall be considered to have integrity failure under the following conditions:

1) Prior to Acceptance Testing

a) If more than 0.05 percent of the fibers are pinned prior to commencement of the Acceptance Testing.

2) After Acceptance Testing

a) If for a single membrane module, more than 0.05 percent of the fibers have required repair (e.g., by pinning or gluing) in any 12 consecutive months.

3) Anytime

a) An individual membrane fiber shall be defined as requiring repair if it visually leaks during an air pressure integrity test at the integrity test pressure.

b) If a module assembly fails the air pressure integrity test and cannot be repaired by pinning or gluing, then the module is considered defective.

c) If the cumulative repairs from the date of manufacture raise the flux rate 0.1 percent above the design flux rate.

d) If more than 0.2 percent of the fibers have required repairs over the life of the membrane module. An individual membrane fiber shall be defined as requiring repair if it visually leaks during an air pressure integrity test at the integrity test pressure.

d. If a membrane unit exceeds the maximum amount of Membrane Integrity Failure Occurrences, all membrane modules within the membrane unit shall be replaced unless:

1) Seller can demonstrate, through lot traceability, that the Membrane Integrity Failure Occurrence is attributed to a specific lot of membrane modules within a previously defined range of consecutive serial numbers.

2) The lot size shall be established by the membrane module manufacturer but shall not be less than 25 modules.

3) The number of membrane modules that are accountable for the Membrane Integrity Failure Occurrences are “localized” to less than 10 percent of the membrane modules located on the membrane unit.

e. If it is demonstrated that the membrane integrity failure defect is attributed to a specific lot or localized, then all membrane modules that have had more than a single previous occurrence of repair shall be replaced, even though they may be located in another membrane unit or may not have exceeded the criteria for individual membrane module integrity failure.

f. If more than two (2) membrane units require complete replacement within a 12 month period, the Buyer shall retain the option to replace all remaining membrane modules.

g. After Final Acceptance, if a membrane module is determined to be non-conforming with respect to membrane integrity, the Seller will remedy in accordance with the requirements set forth in this section.

1) Non-conforming membrane modules may be returned to service under the conditions outlined in this section.

2) If within 60 days after the notification to the Seller it has become apparent to the Buyer that membrane modules are not able to meet the provisions of the warranty, the Buyer will provide the Seller with a breach of warranty claim.

J. Irreversible Flux Loss

1. Membrane modules or elements shall be considered to have non-conforming irreversible flux loss under the following condition.

Definition of “clean water” resistance: The temperature corrected membrane resistance is defined as the “clean water” membrane resistance, as indicated in the Proposal Pricing Form, taken at a minimum of one (1) hour after startup of the membrane unit after completion of the chemical cleaning process, and taken five (5) minutes after completion of the most recent backwash. The temperature correction shall be calculated at 20°C using a viscosity correction factor. The equations and units used to calculate “clean water: resistance are as follows:

$$R = \frac{\Delta P}{J\mu}$$

Where: R = Membrane Resistance (psid/gfdcp)
J = Membrane Flux (gfd)
μ = Viscosity of water (cp)
ΔP = Differential Pressure (psid)

a. Irreversible Flux loss will be stated to have occurred if the MF/UF Units are not able to obtain a minimum of a 30-day clean-in-place (CIP) intervals respectively for 3 consecutive CIP intervals when operated at or below the temperature adjusted membrane design capacity using backwash (MF/UF Units only) and chemical washing procedures and frequencies established and demonstrated for the particular system during the Performance Testing Period.

b. Prior to the end of the first year or operation, each unit will be tested for permeability.

1) Prior to the permeability test, a CIP will be performed.

a) Seller will be allowed to observe the automated CIP cycle.

b) Bid temperature corrected flux rate will be set for each cell prior to the permeability test.

c) The permeability test duration will be run for a minimum of 5 minutes.

2) If the permeability is not at least 95 percent of the bid permeability, the modules will be considered to have non-conforming irreversible flux loss.

2. In the event that the Seller does not believe that the feed water quality is similar to that defined as the design water quality in Section 11 30 00, Hollow Fiber Membrane Equipment, then the Seller may seek relief from its warranty obligations hereunder to the extent that its failure to meet these obligations is caused by a change in the influent water quality that is outside the range of the design influent water quality parameters.

a. However, relief shall require demonstration that there is a defensible water quality parameter and/or duration that is outside of the influent water quality range that caused the warranty violation.

3. Should the Buyer and the Seller fail to agree on the cause of the warranty violation that is related to influent water quality, the matter shall be sent to binding arbitration.

a. The Buyer and the Seller shall jointly select an arbitration panel consisting of water treatment professionals appointed by each party.

b. The panel will consist of two members of each party or other mutually agreed upon number.

c. The panel will then select 1 additional member as mutually agreed upon.

4. The Buyer recognizes that to remedy warranty provisions for irreversible flux loss, the Seller may modify operational protocols.

    a. Seller recognizes that changes to the operational protocols must be acceptable to the Buyer.

    b. The Buyer recognizes that the changes to operational protocols by the Seller pursuant to this warranty provision are acceptable under the following conditions:

        1) That the specified design parameters (e.g., production capacity, water quality, system recovery and CIP interval) are obtained.

        2) That the change in operational parameters and protocols (e.g., backwash, Maintenance Clean or CIP) will not represent an increase in the operational or membrane replacement cost to the Buyer.

    c. If more than two units require membrane replacement at any time within Membrane Module Warranty Period for irreversible flux loss, the Buyer shall retain the option to replace all remaining membrane modules using the applicable membrane module price.

**PART 2 -- PRODUCTS – (NOT USED)**

**PART 3 -- EXECUTION – (NOT USED)**

**PART 4 -- SUPPLEMENTAL INFORMATION**

4.01 MEMBRANE LIMITS

**Normal Operation**

| | |
|---|---|
| Transmembrane Pressure | -3 bar to + 3 bar (-43.5 psi to + 43.5 psi) |
| pH | 1 to 10 |
| Temperature | 0 to 40 degrees C. Consult Pall before using any water treatment polymers |

**Membrane Cleaning (Includes CIP/MC Processes)**

| | |
|---|---|
| Temperature | 40 degrees C. maximum |
| Sodium Hypochlorite | 5,000 mg/L maximum |
| Hydrogen Peroxide | 200 mg/L maximum |
| NaOH | 40 g/L maximum |
| Citric Acid | 300 g/L maximum |

**Membrane Storage**

Store modules between 1 and 40 degrees C. Do Not Freeze.

Short Term Storage: If not in use, flush daily with up to 100 mg/L of free available chlorine.

Long Term Storage: First perform a Clean in Place, store wet, completely filled with 50-mg/L sodium hypochlorite solution.

END OF SECTION

# SECTION 01 75 00 SPARE PARTS

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. Spare parts and materials required to be supplied in the Contract Documents shall be furnished in unopened cartons, boxes, crates, or other protective covering suitable for preventing corrosion or deterioration for the maximum length of storage which may be normally anticipated. Packages shall be clearly marked and identified as to the name of Seller, applicable equipment, part number, description, and location on the equipment.

2. Spare parts and materials shall be delivered to the Buyer at the Point of Destination or other location specified by the Buyer prior to commencing Commissioning of the membrane system.

3. When a spare percentage is listed as a minimum requirement, the fractional quantities shall be rounded up to the nearest whole number. For example, if a 5 percent spare is listed, one spare is required for every 20; therefore, if 21 items were supplied as part of the Contract, 2 spares would be provided.

4. Provide a letter of transmittal and spare parts receiver form including the following:

   a. Date of letter and transfer of parts and material.

   b. Contract title and number.

   c. Seller's name and address.

   d. Applicable Sections of the Project Manual for each set of spare parts supplied.

   e. Acknowledgment signed by the Seller, that all spare parts and maintenance materials have been delivered.

5. The Seller shall be fully responsible for loss or damage to parts and materials until they are received by the Buyer.

1.02 QUALITY CONTROL I QUALITY ASSURANCE - NOT USED

1.03 SUBMITTALS

A. Shop Drawings

1. In accordance with the requirements of Section 01 34 00, Shop Drawing Procedures, provide, as part of the second shop drawing submittal, a detailed list of spare parts with specific models and quantities denoted unique for the Seller to be provided under this Contract for approval by the ENGINEER.

**PART 2 -- PRODUCTS – (NOT USED)**

**PART 3 -- EXECUTION – (NOT USED)**

# SPARE PARTS LIST

1. Diaphragm Pumps
    a. Provide one shelf spare pump for each separate pump type, size, or material provided.
2. Vertical Inline Centrifugal Booster Pumps
    a. Provide 2 sets of spare mechanical seals of each size.
    b. Provide one shelf spare for each pump type, including:
        1) CIP Circulation Pump
        2) CIP Drain Pump
        3) Neutralization Drain Pump
3. Horizontal End Suction Pumps
    a. Provide 1 spare mechanical seal per pump or a maximum of two mechanical seals of each type.
    b. Provide 1 complete spare acid CIP pump including baseplate, motor coupling and pump and any ancillary component equipment, if the pump is installed in a single stand-alone configuration.
    c. Provide 1 complete spare caustic CIP pump including baseplate, motor coupling and pump and any ancillary component equipment, if the pump is installed in a single stand-alone configuration.
4. Compressed Air System
    a. For each compressor
        1) 2 sets of replacement compressor intake filters for each compressor
        2) 2 sets of replacement oil filters
        3) 15-gallons of oil
    b. For the compressed air system
        1) 1 pressure regulator for each type supplied
        2) 1 pressure relief valve for each type supplied
        3) 1 automatic drain valve for each type supplied
        4) Process Air Filters - 2 replaceable filter element for each filter supplied

5. Programmable Logic Control Equipment
    a. Provide 1 spare card PLC or Fieldbus module of each type including
        1) CPU Modules
        2) Network / Communication Modules
        3) Discrete Input / Output Cards
        4) Analog Input / Output Cards
        5) Foundation Fieldbus Interface
6. Process Instrumentation General Requirements and Switches
    a. Provide 1 spare for each type, size, and material
        1) Level Switches- Tank Sidewall Mounted
        2) Level Switches – Float Style
        3) Flow Indicating Vane Switches
        4) Flow Switches
        5) Pressure Switches
        6) Pressure Diaphragm Seals
7. Process Instrumentation Meters and Transmitters
    a. Provide 1 spare for each type or range
        1) Level Transmitters
        2) Low-Flow Flowmeter with Controller
        3) Flowmeters Provide one spare for each size used
        4) Temperature Sensors
    b. Provide 2 spares for each type or range
        1) Pressure Gauges (I-001)
        2) Rotameter
        3) Pressure Transmitters
8. Process Instrumentation Analyzers:

a. Turbidity Meter

1) Provide 1 calibration kit

b. pH Analyzers

1) Provide 2 spare probes

c. ORP Analyzer

1) Provide 2 spare probes

d. Conductivity

1) Provide 2 spare probes

9. Control Panels, Enclosures, and Panel Instruments

a. Provide spare quantities of the following:

1) 6 spare bulbs for each type of bulb used in the control system.

2) 6 spare fuses for each type and size of fuse used in the control system.

3) 3 spare control relays of each type used in the control system.

4) 1 spare type of each signal conditioner (isolator, adder-subtractor, etc.) of each type used in the control system.

10. Ball Valves, Butterfly Valves, Section, Check Valves, Specialty Valves and Valve Actuators

a. If more than 3 valves of any type or kind are provided, the Seller will supply a valve or valve actuator of each size and type used.

b. Butterfly Valves

1) Valve Seats - 2 for each valve size

c. Valve Actuators

1) Seal Kit, for Type Modulating Actuators – Two for each actuator size.

END OF SECTION

# SECTION 11 30 00 – CONTAINERIZED HOLLOW FIBER MEMBRANE EQUIPMENT MEMBRANE TREATMENT SYSTEM

## PART 1 -- GENERAL

1.01 DESCRIPTION

A. Description of Work:

1. This Section specifies the requirements for the design and fabrication of a containerized or trailer mounted membrane filtration (MF) treatment system. It describes the work to be performed by both the MF equipment manufacturer (Seller) to supply containerized membrane treatment systems to the City of Sandy (City) for future installation at the Alder Creek WTP (WTP). The WTP shall have 2 mgd firm capacity.

2. This Specification covers the containerized membrane filtration (MF) treatment system consisting of feed pumps, strainers, membrane filtration units, membrane cleaning and neutralization systems, membrane backwash pumps, excess feed recirculation equipment (if deemed necessary by the Seller for the operation of their system), air supply systems, piping, valves, controls and instrumentation for the complete system.

3. Additive Bid Item. If any container is not completely filled to meet the firm design capacity of 2 mgd, Seller should provide the additional cost for providing full buildout of all required containers. The purposed may be to increase capacity, lower the overall flux rate, or implement future backwash recycle.

4. The Special Engineering Services are to be provided under this contract and include project related activities including: shop drawings submittals and other engineering services.

5. The Special Services are provided under this contract and include project related activities including: O&M manuals, installation, commissioning and acceptance testing field services and operator training necessary for the installation of the System as described within the Contract Documents.

B. Reference Specifications

1. Section 01 08 00, Identification and Tagging

2. Section 01 33 17, Structural Design, Support and Attachment

3. Section 01 34 00, Shop Drawing Procedures

4. Section 01 61 00, Transportation and Handling of Goods

5. Section 01 61 10, Protection of Goods

6. Section 01 62 00, Installation of Membrane Equipment

7. Section 01 66 00, Commissioning of Membrane Equipment

8. Section 01 67 00, Acceptance Testing of Membrane Equipment

9. Section 01 73 00, Installation, Operation and Maintenance Manuals

10. Section 01 74 00, Membrane System and Module Warranty

C. Coordination

1. The design of a membrane filtration system requires considerable coordination between the Buyer, Engineer and Seller. The Seller will provide assistance to the Engineer and Buyer and provide the information needed to coordinate the design of the membrane filtration system and the ancillary equipment designed by the Engineer but not provided by the Seller.

2. The Seller shall provide all parts, equipment, materials, and components including instrumentation and controls. Equipment will be installed and interconnections made by the Contractor under a separate installation contract.

3. The Contractor shall be responsible for installation of equipment furnished under a separate contract and for provision of interconnecting piping and electrical power supply and connections. The Contractor shall assume responsibility for the satisfactory installation of the MF system. Upon completion of system installation will be reviewed and a Notice of Completed Installation shall be issued.

D. Special Considerations

1. Definitions

a. Seller: Containerized Membrane Filtration System Manufacturer

b. Hollow Fiber Membrane: an engineered self-supporting non-woven porous media of polymeric material with an outside diameter of 0.2 to 2.0 mm and an absolute pore size of less than 0.5 micron. Absolute pore size is defined as obtaining greater than 6-log removal (99.9999 percent) of particles or microorganisms of a known size.

c. The Containerized Membrane System pertains to the fiber membrane filtration equipment. The System shall contain at a minimum the following components:

1) 2 Membrane Units

2) Cleaning system

3) Compressed air system

4) Backwash tank and pump

5) Feed pumps and automatically backwashing strainers

6) HVAC system

7) Controls system

d. Air Scrub (AS) – Use of air during backwashing to dislodge contaminants from the membrane module.

e. Backwash - The periodic reversal of flow through a filter which may be accompanied by water in conjunction with air or oxidants at a low concentration (less than 10 mg/L of total chlorine) generally associated with the intermittent waste stream from an ultrafiltration or microfiltration membrane system used to remove particulate matter. Same as Reverse Filtration or Backpulse.

f. Container – The structure that houses the containerized membrane system shall be a shipping container or shipping trailer able to be placed by crane or truck, manufactured of corten steel and contain all system components integral to the containerized unit described in this specification.

g. Chemical Washing / Maintenance Cleaning - The periodic application of a concentrated chemical solution at high concentration (i.e. more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10) to the membrane for a short duration of time (two times per day maximum for a total duration of less than 60 minutes) for the intended purpose of maintaining membrane permeability or reducing membrane fouling by a factor of less than 33 percent of the total amount of fouling that may be observed by the membrane.

h. Clean In Place - The periodic application of a concentrated chemical solution at high concentration (i.e. more than 10 mg/L of free chlorine or the addition of an acid which results in a pH of less than 4 or the addition of a base that results in a pH of greater than 10, or a surfactant or enzymatic cleaning agent) a membrane for an extended, duration of time (more than 60 minutes per day) for the intended purpose of reducing membrane fouling by a factor of more than 33 percent of the total amount of fouling that may be observed by the membrane.

i. Module - A membrane module is a complete unit composed of the membrane fibers, a housing, feed inlet, and filtrate outlet.

j. Train - A group of membrane modules arranged together and that share common feed and filtrate piping. Modules arranged such that the following are performed on all modules in a Train (Backwash, Clean In Place Chemical washing / Maintenance Clean)

k. Unit - The water production entity of a membrane system. A unit consists of a number of membrane modules that share feed and filtrate valving, and the units can usually be isolated from the rest of the system for testing, cleaning, or repair. Also called racks, trains (in conflict with the above definition), or skids

2. Design or Performance Requirements

a. It is the intent of this Specification and the Drawings to identify major components of the System and to establish minimum equipment and quality standards for these components. It is the Seller’s responsibility to provide all parts, equipment, materials, and components required for a complete and functional System.

b. Acceptable Sellers: Based on the Buyer's review, the following MSS's have demonstrated competent and are accepted by the Buyer to propose on this project:

1) PALL Water

2) WesTech

3) H2O Innovation

c. Based on the Buyer's review, the following membrane modules and membrane element manufacturers are pre-qualified are accepted by the Buyer:

1) PALL (ASAHI) UNA-620A Microfiltration Membrane Module

2) Toray HFUG2020AN Ultrafiltration Membrane Module

3) DuPont IntegraTec XP 77 IG

4) Membrane modules shall be positive-pressure type, PVDF hollow fiber construction, using an outside-in flow path. The membrane shall nominal pore size shall not exceed 0.1 micron.

3. Alternatives:

a. Alternative Sellers, Membrane Element Manufacturers, and membrane modules will not be considered.

4. Drawings:

a. The Seller shall furnish all components identified on the Drawings and as specified in this Section. If an item is shown to be furnished by either the Drawings or the Specifications, it shall by furnished whether or not shown on both.

b. The Seller shall furnish all components for complete and operatable containerized systems. The scope of supply is as follows:

1) Membrane containers (includes steel supports, HVAC, insulation, and piping within container)

2) Membrane modules

3) Feed pumps

4) Automatically backwashing strainers

5) Backwash pumps

6) Control and isolation valves

7) Clean-in-Place equipment for each containerized membrane system

8) Compressed air systems

9) Feed and filtrate turbidimeters

10) Backwash supply tanks

11) Electrical panels

12) Variable Frequency Drives for feed, backwash, and CIP pumps

13) Custom programming and components as needed to interface with plant feed and finished water equipment, as well as existing process equipment.

14) Start-up and training services

15) All other appurtenances listed herein, as required or shown on the drawings

c. The Seller is responsible for monitoring and controlling the MF System and other equipment shown on the Process and Instrumentation drawings and for interfacing any other plant controls or systems identified.

d. The MSS's shall supply a remote monitoring system, which combines early detection of any issues that may arise, system optimization, remote troubleshooting and accessibility of systems, and common data storage all into one, simple platform.

e. Drawings have been prepared for the purpose of obtaining a Proposal for the supply of goods and special services and are presented as a suggested system layout. Exact system details may differ per manufacturer.

f. The equipment type shall be reviewed by the Seller to assure that it satisfies the minimum requirements deemed appropriate for the intended service.

g. Final pipe sizing shall be by the Seller during detailed design after the Seller has been selected.

h. The Seller shall review equipment and line sizing for equipment that is to be provided by the Seller for consistency with their particular process.

i. General Systems Drawings are shown on I-001 to I-007. These drawings may differ from the installed system depending on the selected Seller. Systems integral to each containerized unit such as the backwash system and CIP system are not shown but included in the scope of supply by the Seller.

1.02 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC)

A. Manufacturer's Qualifications: All equipment furnished under this specification shall be new and shall be the standard product of a manufacturer who is fully experienced, reputable, qualified and regularly engaged for at least 5 years in the manufacture of the equipment to be furnished.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. American Society of Mechanical Engineers (ASME)
    a. ASME Boiler and Pressure Vessel Code
2. American Society for Testing and Materials (ASTM)
    a. ASTM A 193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
    b. ASTM A 36, Standard Specification for Structural Steel
3. American National Standards Institute (ANSI)
    a. ANSI B16.5 - Pipe Flanges and Flanged Fittings
    b. AWS D1O.9, Standard for Qualification of Welding Procedures and Welders for Piping and Tubing
4. American Welding Society (AWS)
    a. AWS A5.9 - Specification for Bare Stainless Steel Welding Electrodes and Rods
    b. AWS D1.1 - Structural Welding Code - Steel
    c. AWS D1O.9 - Standard for Qualification of Welding Procedures and Welders for Piping and Tubing
5. Institute of Electrical and Electronic Engineers (IEEE)
6. National Electric Code (NEC) National Electrical
7. Manufacturers Association (NEMA)
8. Standards of National Electrical Manufacturers Association
9. Standards of American Water Works Association (AWWA)
10. National Electric Code (NEC)
11. National Sanitation Foundation (NSF)

C. Manufacturer's Quality Assurance/Quality Control Program
    1. The manufacturer shall have in place a dedicated quality control/quality Assurance program.

1.03 SUBMITTALS

A. Shop Drawings
    1. Coordination Meetings

a. Within fourteen 14 days after execution of the Agreement, the Seller shall meet with the Engineer at the Engineer's location to address any issues related to the project. The Seller shall prepare and submit a project specific process and instrumentation diagram (P&ID) of the proposed containerized membrane systems, and neutralization system for discussion.

2. Drawings and Samples:

a. The Seller shall submit for review and approval in accordance with the Shop Drawing Procedures the following First Shop Drawing Submittals in accordance with Section 01 34 00, Shop Drawing Procedures. All drawings shall be submitted electronically in pdf format. Electronic drawings shall also be submitted in 3-D format compatible with the Revit design model. The Seller shall submit the following information:

1) Schematics Drawings:

a) P&IDs of the System, including hydraulic and pneumatic schematics detailing the equipment supplied by the Seller and showing equipment provided by others that will interface with the System.

b) Provide a P&ID of a typical membrane unit including hydraulic and pneumatic schematics detailing the equipment supplied by the Seller.

c) The Engineer, Buyer and Seller are responsible for establishing the P&ID tag numbering for the units and the system. The identification and tag numbering shall be in accordance with Section 01 08 00, Identification and Tagging.

d) Electrical schematic diagrams including motor horsepower and other electrical load information and identification of external wiring (panel) connections and for coordination with the Contractor supplied VFDs.

2) Containerized System Drawings: The Seller shall coordinate production and submit each of the following Arrangement drawings for approval:

a) Provide plan and elevation views of containerized membrane system and all equipment to be included in container.

b) Clearly identify the termination points and physical location for hydraulic, pneumatic and electrical connections where interfacing of the Seller supplied equipment and equipment to be installed by the Contractor exists

c) Once submitted and approved the "physical envelope" of the Seller supplied equipment or termination points shall not change without approval of the Engineer

d) A bill of materials for all tagged devices and components supplied with the Unit including component original part numbers identifying each furnished component

3) Containerized Neutralization System Drawings: The Seller shall coordinate production and submit each of the following Arrangement drawings for approval:

a) Provide plan and elevation views of skid mounted neutralization system. The CIP tank does not need to be mounted on the skid, it will be shipped loose for installation and connection to the Neutralization skid by the contractor.

b) Clearly identify the termination points and physical location for hydraulic, pneumatic and electrical connections where interfacing of the Seller supplied equipment and equipment to be installed by the Contractor exists

c) Once submitted and approved the “physical envelope” of the Seller supplied equipment or termination points shall not change without approval of the Engineer

d) A bill of materials for all tagged devices and components supplied with the Unit including component original part numbers identifying each furnished component

4) The Seller shall attend a meeting with the Buyer within 10 days after the submittal of the first shop drawing for coordination and review.

b. The Seller shall submit for review and approval in accordance with Section 01 34 00, Shop Drawing Procedures.

1) Manufacturer’s literature, illustrations, specifications, weights, pump curves, and engineering data for project engineered equipment including dimensions, materials, sizes, and performance data.

2) Piping Fabrication and Assembly Drawings: For all MF system piping, provide double-line scaled drawings showing all fittings, valves, instruments and supports.

a) Provide fabrication details for piping and structures elevation views of all major components and subsystems, detailing orientation of equipment, piping, fittings and valves (including valve actuators).

b) Identify piping materials and fabrication details as required by Section 15 06 20, Stainless Steel Pipe and Tubing.

c) Each support shall be identified by catalog number or shop drawing detail number.

3) Containerized membrane system:

a) A bill of materials for all tagged devices and components supplied with the containerized membrane system including component original part numbers identifying each furnished component. For all tagged devices supplied, the Seller shall develop a “Cross Reference Schedule” that matches the Tag to the appropriate equipment manual. The equipment schedule shall include the pertinent information associated with the equipment including tag number, description, functional name location, component equipment model, part number, size, materials, accessories and range. The Cross-Reference Schedule shall be provided in the form of a Microsoft Excel (.XLS) spreadsheet.

4) Design Calculation:

a) Design calculations related to sizing of key components, including the overall System, pumps, valves, Units, process air system, backwash system, CIP system, chemical transfer pumps, CIP pumps, and electrical controls and instrumentation supplied by the Seller. Calculations for the piping system shall be sufficient to demonstrate that the system is hydraulically stable (balanced) under normal and backwash operation within the Seller’s and/or good engineering practice limits. Submittals for pump(s) and throttling and modulating valve(s) shall also include calculations to show that cavitation does not occur over the intended minimum and maximum operating range.

b) Other submittals and/or shop drawings as required under the Contract Documents

c) Submit data as required by the applicable components of Section 11 00 00, General Equipment Provisions.

5) Information as specifically requested by the Engineer or Buyer in support of this Project.

6) The Seller shall attend a meeting with the Buyer within 10 days after the submittal of the second shop drawing for coordination and review.

B. Factory Test Reports

1. Quality Control Reports

a. Factory Test and Seller Quality Control Reports for all equipment provided including the Factory Test Report for the PLC/HMI system functional performance test reports

b. Factory Test Reports for all Control Panels

C. Installation Instructions: Refer to Section 01 62 00, Installation of Membrane Equipment.

D. Commissioning Plan: Refer to Section 01 66 00, Commissioning of Membrane Equipment.

E. Operation and Maintenance Manuals: Refer to Section 01 73 00, Installation, Operation and Maintenance Manuals.

F. Training Manuals: Refer to Section 01 73 10, Training of Operations and Maintenance Personnel.

G. Record Drawings: In accordance with Section 01 73 00, Installation, Operation and Maintenance Manuals, after completion of Acceptance Testing the Seller shall revise and submit to the Buyer revised O&M Manuals using As Installed information.

H. Certificates, Warranties and Guarantees

1. Refer to Section 01 74 00, Membrane System and Module Warranty

2. Seller “Acceptance of Installation” following equipment installation.

3. Regulatory Agencies: The Seller shall supply hydraulic calculations and drawings for the System and any other system performance data specifically required by regulatory agencies.

## PART 2 -- PRODUCTS

2.01 SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS

A. Process Description

1. The Alder Creek Raw Water Pump Station (RWPS) intake pumps will provide source water for treatment. The feed stream will receive chemical addition by aluminum chlorohydrate coagulant, sodium hypochlorite (optional), and sodium hydroxide followed by mixing and storage in the membrane filtration feed tank. These system components can be found on Drawing I-004.

2. Process and Instrumentation Drawings (P&IDs) for the membrane filtration system including the associated chemical feed systems have been developed to detail the equipment to be provided. The Drawings have legend sheets that describe the symbols and abbreviations used on the P&IDs.

3. The requirements for the equipment type are cross-referenced in the specifications. The equipment type identified should be reviewed by the Seller to assure that it satisfies the minimum requirements deemed appropriate for the intended service.

4. The feed stream shown on Drawing I-001 may have undergone pre-treatment via coagulation and chlorination and pH control prior to entering the membrane feed tank. Flow from the feed tank will be split between one of two or three containerized membrane systems, as determined by the containerized system capacity.

5. Membrane feed pumps (located inside each containerized unit) will discharge water through automatically backwashing strainers and to the membrane filtration units, both located within the containerized unit.

6. Feed pressure will be used to backwash the automatic backwashing strainers. The feed system is controlled using the pressure transmitter located downstream of the strainers. Backwash flow from the strainers will be measured and routed to a manhole where it combines with other waste streams and then discharged to existing backwash ponds. Clarified water from the backwash ponds is not expected to be recycled to the head of the WTP at the time of installation of the containerized units but may be recycled in the future.

7. A spare or standby membrane filtration rack will provide redundancy to the membrane to achieve an (N+1) system design. A rack is considered redundant if it has the following components:

    a. Dedicated feed pump

    b. Dedicated strainer

8. Drawing I-002 shows the arrangement of interconnecting piping for the containerized membrane treatment units. Note that the design of the interconnecting piping is to be prepared by the Seller.

9. The feed shall be designed with an air/vacuum relief located at the highest point of the membrane unit to relieve air that may have accumulated during the air scour sequence or relieve vacuum conditions during draining of the unit. Prior to discharge, the filtrate flow is measured and the turbidity is also monitored.

10. The common filtrate discharge pipe will have chemical addition for disinfection and pH control. Filtrate discharge piping and pH control equipment will be supplied by the contractor. pH control equipment will be supplied by the plant control system and does not need to be controlled by the Sellers equipment.

11. The filtrate will enter a chlorine contact tank that will be constantly full and then will discharge to distribution through a high service pump station.

12. Water for backwashing membrane modules should be supplied by filtered water produced by the containerized units. Each containerized unit should be equipped with a filtrate tank to provide water for backwashing. The backwash pumps will be driven by VFDs for flow control.

13. The CIP system will be integral to each containerized unit and be supplied by the Seller including air diaphragm metering pumps and instrumentation for chemical addition during the CIP process.

14. Spent cleaning and chemical maintenance cleaning waste are collected, pH-neutralized, and dechlorinated in the neutralization tank prior to discharge. The neutralization system is shown on Drawing I-004. The neutralization system, shall be skid mounted and all necessary equipment including pumps, instrumentation and the neutralization tank should be supplied by the Seller. Neutralized CIP waste solution will discharge to a holding tank at the WTP site. Neutralized chemical maintenance clean solution will discharge to the Backwash pond.

15. Citric Acid (50%) will be delivered in totes or drums, located outside of the containerized membrane systems, and will be transfer-pumped to the acid CIP tank or Neutralization tank as needed by pumps supplied by the Seller.

16. Sodium Hydroxide (25%) will be delivered in bulk and will be transfer-pumped to the Caustic CIP tank or Neutralization tank as needed as shown on Drawing I-005. Transfer pumps needed for containerized system operation to be provided by seller.

17. Sodium Hypochlorite (12.5%) will be delivered in bulk and will be transfer-pumped to the Caustic CIP tank as needed as shown on Drawing I-006. Transfer pumps needed for containerized system operation to be provided by seller.

18. Aluminum Chlorohydrate coagulant will be dosed to the raw water and equipped will be supplied by Contractor.

19. Calcium thiosulfate will be delivered in liquid form by 55 gal drums and will be transfer-pumped to the neutralization tank as needed as shown on Drawing I-004. Transfer pumps will be supplied by the Seller.

20. Each containerized system shall have a dedicated PLC or Remote I/O module(s) which shall report back to the centralized PLC. The seller shall also supply a master PLC to control communications between each trailer and the neutralization system.

21. The master PLC shall be complete with a secondary standby, hot-swappable PLC system that shall be capable of taking over system operation in the event of a failure to the primary PLC.

22. A compressed air system shown will supply control air including air for daily integrity testing, air scour cleanings during backwash, pneumatically controlled valves, and supply any pressurized air required by the neutralization system. Each containerized unit will be equipped with a compressor, dryer, receiver and filters.

B. Service Conditions

1. Ambient Environment. The equipment furnished under this section will be installed at the locations shown on the Drawings. The site conditions are expected to be as follows:

   a. Ambient Air Temperatures: 25°F to 105°F

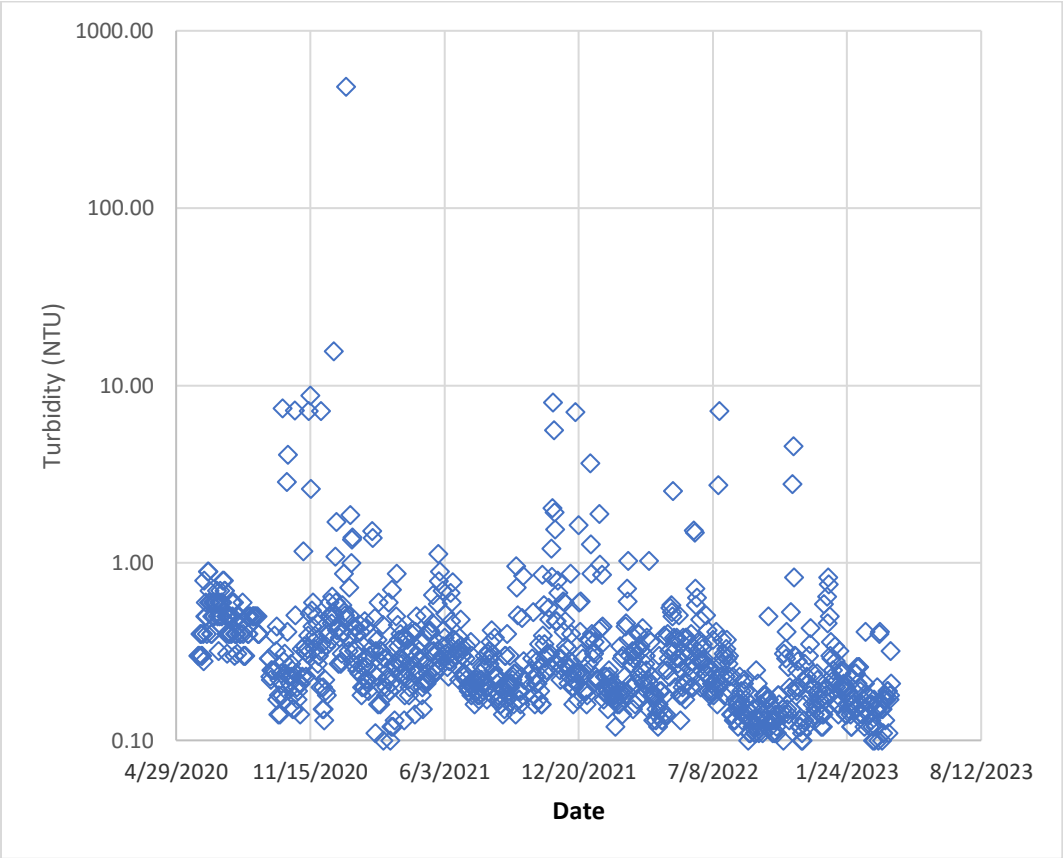
   b. Relative Humidity: 0 to 100 percent noncondensing

   c. Altitude: 1,078 feet above Mean Sea Level

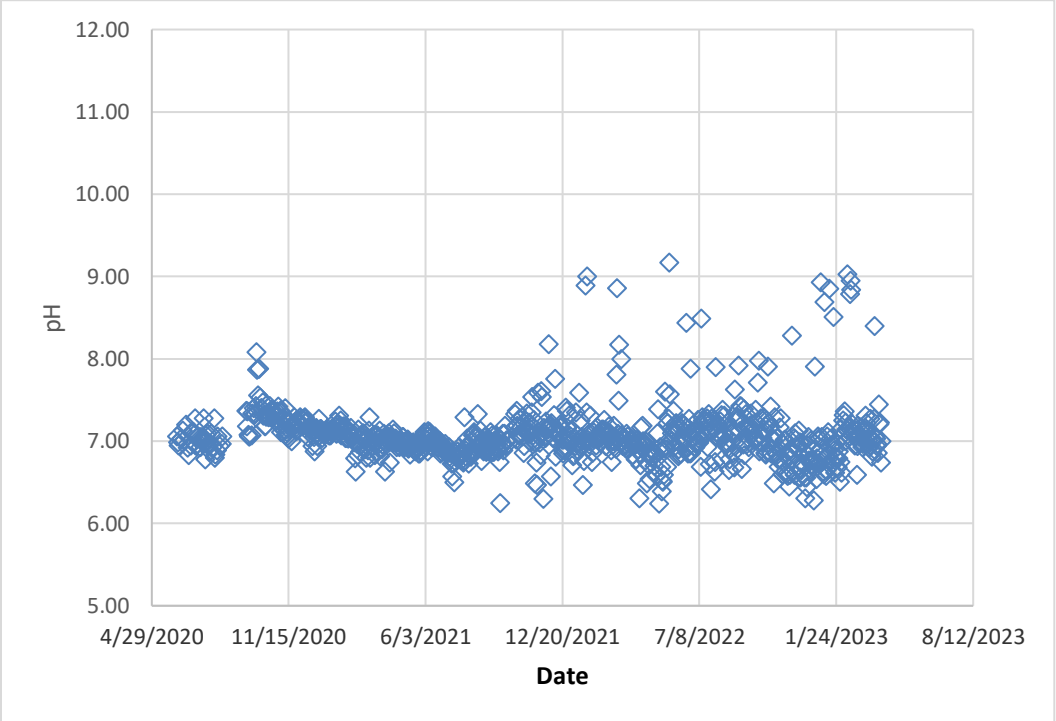
   d. Environment: Rural area west of the City of Sandy, approximately 38 percent sunny days, annual rainfall approximately 78 inches, winds up to 42 mph and potential for wildfire smoke.

2. Feedwater Quality: Historical Water Quality information is somewhat limited from the existing WTP but is as follows:

   a. Turbidity:


1000.00
100.00
10.00
1.00
0.10
Turbidity (NTU)
4/29/2020
11/15/2020
6/3/2021
12/20/2021
7/8/2022
1/24/2023
8/12/2023
Date

b. pH


12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
pH
4/29/2020
11/15/2020
6/3/2021
12/20/2021
7/8/2022
1/24/2023
8/12/2023
Date

c. Raw water temperature: 5 deg C to 15 deg C

d. Additional sampling data was performed on 11/17/23 and is listed below:

1) Iron – non-detect

2) Manganese – non-detect

3) Alkalinity – 26 mg/L as $CaCO_3$

4) Total Organic Carbon – 0.63 mg/L

5) Ammonia – non-detect

6) Nitrate/Nitrate – Non-detect

7) Total Suspended Solids – non-detect

3. Process Design Requirements: Raw water will receive coagulant injection, mixing, with reaction time in the membrane feed storage tank. Sodium hypochlorite and sodium hydroxide and could be added to the raw water for disinfection, and pH increase.

4. Estimated design elevations to be refined during fnal design:

a. Process Inlet Water Level

1) ~1078.0 ft EL

b. Plant Site

1) ~1076.0 ft EL

c. Filter Discharge Water level

1) CT Tank High water level – ~1077.0 ft EL

C. Process Design Requirements

1. Overall System Design Philosophy

a. The facility consists of coagulation, feed tank storage reaction time, containerized membrane filtration systems (including feed pumps, automatically backwashing strainers, backwash, process air, CIP and provisions for chemical maintenance cleaning), a neutralization system, Chlorine disinfection, filtered water storage, and a high service pump station. Membrane backwash waste will be coagulated and sent to a solids holding pond. CIP waste shall be pH-neutralized, dechlorinated, and discharged to a holding tank for future disposal. Chemical maintenance cleaning waste shall be pH-neutralized, dechlorinated and discharged to the solids holding ponds.

b. The design philosophy for the facility is that the Seller shall provide enough containerized membrane systems to provide redundancy such that N+1 membrane racks are provided between all containerized units.

c. The membrane filtration system for the Alder Creek WTP shall be capable of producing 2.0 mgd of water (net) for drinking. The capacity shall be calculated using the net filtrate with one membrane rack out of service.

2. Membrane System Design Criteria: The Seller shall list guaranteed design and operating criteriaThe selected Seller shall demonstrate the guaranteed design and operating criteria during a proof pilot test per Section 11 30 20, Performance Pilot Testing of Membrane Equipment. If design and operating criteria cannot be demonstrated, the Seller shall adjust the pilot test and full-scale system accordingly at no additional cost to the Buyer per Section 00 52 00, Procurement Agreement.

a. Membrane Flux:

1) The average membrane design flux shall not exceed 50 gfd instantaneous with one train out of service on the maximum day achieving the net filtrate capacities listed above. The flux shall be in units of gallons per day per square foot of membrane surface area using the feed side of the membrane.

b. Design Capacity and Design Temperature:

1) Design Capacity/Temperature

a) 2.0 mgd @ temperatures 5 deg C and greater

c. Number of Containerized Membrane Systems

1) Minimum: 2

d. For the purpose of determining membrane surface area required .and maintaining the provisions of membrane warranty for CIP interval, the maximum design capacity of 1.8 MGD for the membrane facility will not be adjusted for water temperatures above 5 deg C.

1) The Buyer may operate the membrane facility at any capacity up to the amount maximum permitted by the Oregon Health Authority or at 1.5 times the maximum presented turbidity conditions without invalidating the membrane warranty.

e. Excess Capacity / Redundancy:

f. Recovery: The system shall operate at or above the Seller's design recovery at all times during operation. Design recovery values shall be calculated as follows:

[Net filtered water (mgd)/Net feed (mgd)] x 100 percent

Where the quantity: net filtered water (mgd) is equal to the total amount of filtered water produced (mgd) less any amount used for backwashing of the membrane filters (mgd) on a time weighted average. Net facility capacity is based on the amount of water discharged from the membrane minus water supplied to the backwash system. Net feed is the amount of water that enters the treatment facility. The facility capacity includes the amount of filtrate that is required for backwash and water that is used as part of a chemical maintenance cleaning process. Strainer losses or recovery of backwashing waste through clarification / recycle are not considered as part of the recovery calculation. Water used for CIP or CIP rinsing is not included in the calculation of recovery.

Minimum Recovery for Membrane System 95%

g. Minimum Chemical In Place Interval: 30 days*

* Refer to Section 01 74 00, Membrane System and Module Warranty for language regarding the criteria for Clean-in-Place interval

h. Minimum maintenance cleaning interval: 72 hrs frequency

i. Filtered Water Quality Requirements: Filtered water quality shall meet the following water quality requirements:

1) Turbidity

a) Maximum filtered water turbidity (ntu): 0.15

b) Maximum filtered water turbidity 95% of time (ntu): 0.10

2) Microbiological Removal Efficiency

a) Minimum *Giardia* Removal: >4-log (99.99 percent)

b) Minimum *Cryptosporidium* Removal: >4-log (99.99 percent)

## 2.02 EQUIPMENT DESIGN AND FABRICATION REQUIREMENTS

A. General System Requirements

1. The System shall be suitable for installation in an outdoor environment maintained between 25 degrees F and 105 degrees F.

2. Miscellaneous

a. Lifting Lugs: All equipment items or component assemblies weighing in excess of 100 pounds shall be furnished with lifting lugs.

b. Miscellaneous Fasteners: Bolts, nuts, washers, flange backing rings, and other miscellaneous metal components not specifically addressed elsewhere in these specifications shall be Type 316 stainless steel.

c. Pumps, compressors and. Ancillary equipment shall be sized using the Seller design criteria established during pilot testing and will accommodate the maximum number of membrane modules per membrane unit assembly as indicated in the Proposal Pricing Form.

3. Cross Connection Control

a. The Seller shall design the membrane process with cross-connection control (block and bleed) to assure that chemical solutions used as part of a Chemical Maintenance Clean or Clean in Place process do not come in contract with raw or filtered water. Any chemical solution that does not fit the criteria defined as backwash shall be deemed as a cleaning solution. If a block and bleed system is not able to be installed within the container, the Seller shall include a block and bleed system to be installed at the filtrate connection of each container to be controlled by the containerized unit.

b. Any cleaning process, other than backwashing, must use a cross connection control strategy. Cross connection control shall be automated.

c. The cross-connection control strategy shall segregate the supply of the cleaning solution (chemical maintenance clean or Clean In Place solution) from the backwash solution.

d. The cross-connection control strategy shall isolate the individual membrane unit from the membrane train during the chemical maintenance clean or Clean in Place process. The cleaning solution shall be adequately rinsed from the membrane unit using raw or filtered water. Analytical instrumentation shall be used to confirm that the cleaning solution has been adequately rinsed.

e. The cross-connection control strategy shall be structured and interlocked such that the supply or discharge of cleaning chemicals remain segregated from the backwash.

f. If a common manifold is used for the delivery or discharge of two or more cleaning solutions, the common manifold shall be flushed and drained before a change in chemicals is made.

g. As a minimum, the cross-connection control strategy shall incorporate “double block and bleed” physical isolation for the filtrate for each containerized unit and at other locations as shown on the Drawings. Backwash supply shall be protected by a check valve located on the common line to the units.

4. Piping System Design

a. The Seller shall use piping materials that are suitable for the intended service inside the containerized units. “L” (Low carbon) grade 300 series stainless steel is required for welded pipe and fittings.

b. Rack Interconnecting Piping: Sch 80 PVC, HDPE, or 316 SS

c. All piping (including flanges), valves and components that comprise the permanent piping system on the membrane unit shall be pressure rated for a minimum of 150 psi.

d. Unless stated otherwise or approved by the Engineer, a maximum fluid velocity of 10 feet per second shall be used for the design of the pressure piping systems.

e. Unit piping shall be arranged in order to assure that a straight run of pipe is used for the flow meters. If not possible, the vendor shall use 0D (Zero Diameter) flow meters or submit a letter of acceptable use from manufacturer. For the purposes of determining the length of a straight run, the length is determined by the length of the spool piece of pipe used before or after the flow meter. Flow meter lay length shall comply with the flow meter manufactures installation requirements or have manufacturer acceptance of installed straight lengths. The flow from each Unit shall be measured directly or through addition or subtraction of two or more flow meters.

f. 2-1/2", 3-1/2" and 5" pipe sizes are not permitted unless approved in writing by the Engineer.

g. Unit piping of 1-inch or less in diameter may utilize SCH 80 PVC or a suitable material.

h. Tubing and other wetted sensing lines shall use type 316 Stainless Steel or poly tubing.

5. Pneumatic System:

a. When used, pneumatic solenoid valves shall have a pilot indicator and a manual override.

b. Pneumatic lines shall be of 304 or 316 stainless steel, HDPE, or polyurethane construction.

c. Plastic valves, check valves and other appurtenances are not permitted on compressed air lines.

d. Seller shall install flow controls as required to regulate valve actuation in order to prevent hydraulic shock.

e. The inlet to the membrane unit process shall include a check valve to prevent contamination of the air supply.

6. The Seller shall submit calculations to the Engineer that verify that valve or pump cavitation does not occur over the intended operating range.

B. System Design Requirements

1. P&IDs for each system have been developed. The purpose of these Drawings is to provide the Seller information for the project and define the scope of equipment to be provided. Equipment and appurtenances not specifically shown on these Drawings but required for operation of the system shall be provided by the Seller.

2. The P&IDs show the process design intent for the project and provides the necessary equipment, valves, and instrument necessary to control the process based on the MF Pilot Testing.

a. The proprietary control is not shown on the drawings and is to be developed by the Seller in accordance with the Contract Requirements. The Seller is solely responsible for establishing the control of the MF System shown on the P&IDs and for interfacing with the plant control system.

b. The Seller shall develop P&IDs using the three-layer format identifying all I/O (analog discrete and digital) at the PLC and HMI levels as shown on the Drawings. Refer to Drawing PI-3 for the minimum typical instrumentation and control requirements. PLC and HMI operations shall be indicated on the Seller drawings and include ranges, alarms, set-points, control, primary interlocks and trending functions detailed at a sufficient level of indicate the intended operation of the system.

c. Typical P&ID drawings will only be accepted for identical membrane filtration units.

3. Membrane Filtration Units

a. Each unit shall consist of hollow fiber membrane modules.

b. The modules shall be connected in manifolded blocks and supported by the MF unit framework. Modules for each block shall be tested at the factory.

c. Each containerized system shall be provided with horizontal end suction pumps.

d. The membrane modules shall be supported by a steel framework in a vertical orientation. The modules shall be connected to their manifolds with Victaulic and slip joint connectors. All seals shall be EPDM.

e. Each containerized system shall be divided into identical Units. Identical consists of functionally independent (independent electrical and hydraulic control), and of the same hydraulic capacity. Differences in what appears to be unit symmetry (hand) are not acceptable. Each membrane, including the spare, shall be of identical design and shall accommodate the same maximum number of membrane modules. The spare shall be equipped with the same number of modules as the primary membrane units.

f. Functionally independent means that each membrane unit shall be capable of independent operation for its process sequences upon initiation. It is not acceptable 1) to share valves or instrumentation that perform similar internal functions between membrane units or 2) require that all membrane units be removed from normal filtration and backwashing to perform a function or sequence.

g. Unit support frames shall be designed to resist gravity and seismic forces of the pressure vessels, piping and other related equipment supported by the frame. These supported items shall not be considered as structural members of the support frame. The frame shall be designed in conformance with the latest edition of the International Building Code (IBC) design criteria per Section 01 33 17, Structural Design, Support, and Attachment, and signed by a Registered Professional Structural Engineer currently licensed in the State of Oregon.

4. Backwash and Air Scrub (AS) System:

    a. The backwash system shall be designed for the number of membrane Units, as shown on the Drawings. General Requirements for the backwash System are as follows:

        1) Spent backwash water exiting the Unit shall be discharged in a controlled manner. Intermittent backwashes will be discharged to the solids handling ponds.

        2) The backwash sequence shall be designed so that the same volume (amount of water in gallons) of backwash water is produced per Unit backwash irrespective of the degree of membrane fouling (resistivity or permeability) or variation in water temperature (viscosity effect).

        3) Control programming shall be configured with appropriate software time delays to avoid rapid pump or membrane flow cycling in response to transient dynamic hydraulic effects caused by backwash; or chemical maintenance cleaning cycles. “Deadheading” or any operation of any pump under a “zero-flow” or “flow condition below the pump manufacturers acceptable limits” is not acceptable. Interlocks shall be provided to prevent operation of the any pump under a “dead-headed” condition.

        4) The MF units shall utilize a reverse flow back flush (backwash) to remove accumulated particulates and maintain the design filtrate production rate. Filtrate shall be introduced into the filtrate side of the fibers flushing dislodged solids to waste.

        5) The units shall incorporate an AS sequence to periodically agitate the exterior fiber surface. Dislodged solids shall be diverted to waste.

        6) The backwash and AS cycles shall be initiated through the process control system using totalized volume. The backwash and AS processes shall be carried out automatically through the PLC.

        7) The compressed air system supplying low-pressure air for the AS cycle will be provided by the Seller and integral to each containerized membrane system.

5. Clean-In-Place (CIP) and Chemical Maintenance Clean (MC)

    a. Each containerized membrane system shall be provided with a CIP tank and accessories. The CIP system will include a CIP circulation pump, a CIP drain pump, valving, and instrumentation as shown on the Drawings. Circulation and drain pumping can be performed by one pump if suggested by manufacturer. A single pump shall be installed in each containerized unit with one shelf spare provided for the project.

    b. The Seller shall supply equipment and appurtenances as shown on the P&ID Drawings.

c. There shall be a shared tank for acid and caustic CIP solutions. The system shall include accessories, tank heater control panel, heaters and controls, and analyzers as shown on the Drawings.

d. Spent CIP solution shall be discharged in a controlled manner. Intermittent CIP solutions will be discharged to the neutralization tank for pH-neutralization, dechlorination, and equalization. The neutralization system shall include a neutralized waste pump that can be used to mix the tank contents or discharge the tank contents to either the sanitary sewer for CIP wastes or the solids drying beds for maintenance clean wastes.

e. There will be one citric acid dose transfer system, one sodium hydroxide transfer system, and one sodium hypochlorite transfer system provided to supply concentrated chemicals to the CIP tanks.

f. Heaters shall be provided for heating of CIP solutions. The heaters shall be sized to elevate the water temperature to the desired level and maintain the temperature during the CIP cycle. Heaters shall meet the following requirements:

| | |
|---|---|
| General | Heater with thermocouple, Type K, NEMA 4X |
| Sheath | Incology 800 / Titanium |
| Flange | 304 SS |
| Gasket | Fiber |
| Seal type | Epoxy |
| Power requirements | 460 V, 3 ph, 60 Hz |
| Minimum energy demand (kW) | 80 |

g. Recommended Manufacturers for Tank Heaters:

1) Indeeco, or approved equal.

h. Seller shall provide the necessary interlocking logic to assure that a Unit being chemically cleaned is isolated from the MF System as shown on the P&ID Drawings.

i. The design of the chemical cleaning system shall incorporate automatic safety features to assure that cleaning solution is adequately rinsed from the MF System and will not contact filtered water.

j. When not in operation, each Unit shall be capable of being stored in a CIP solution or other suitable storage solution.

k. The cleaning pumps shall be per vertical in-line centrifugal type.

6. Chemical Maintenance Clean (MC)

    a. General: The maintenance clean system will utilize the CIP system described above with similar control system requirements.

        1) The Seller shall provide the chemical transfer and solution mixing equipment and controls to batch the maintenance clean solution that is used for chemical cleaning of the Units as shown on the P&ID Drawings.

        2) Spent maintenance cleaning solution shall be discharged in a controlled manner. Intermittent chemical cleaning solutions will be discharged to the CIP neutralization system and then to the solids drying bed.

        3) Heaters shall be provided for heating of maintenance cleaning solutions. The heaters shall be sized to elevate the water temperature to the desired level and maintain the temperature during the maintenance clean cycle. Heaters shall meet the same requirements mention above for the CIP system.

        4) The Seller shall provide the necessary interlocking logic to assure that a Unit being cleaned is isolated from the MF System as shown on the P&ID Drawings.

        5) The design of the chemical cleaning system shall incorporate automatic safety features to assure that cleaning solution is adequately rinsed from the MF System and will not contact filtered water.

7. Each containerized system shall be equipped a Membrane Filtrate Monitoring System consisting of a Membrane Filtrate Sample System and a Membrane Integrity Test System.

    a. Membrane Filtrate Sampling System

        1) An automatic sample valve located on the filtrate (permeate) discharge line on each membrane rack.

        2) The sample valve shall open when the unit is producing water. The sample line shall be connected to a turbidity meter provided by the Seller. Power for the turbidity meter will be sourced from the Unit control panel. The analog signal from the turbidity meter shall be routed into the Unit PLC or Remote I/O.

        3) An automatic sample valve located on the common filtrate (permeate) discharge line connecting each containerized unit and provided by the Contractor.

    b. Membrane Integrity Test system to verify the integrity of membrane modules:

        1) The membrane integrity test system shall use air pressure to verify the integrity of the membranes.

2) The applied test pressure of the membrane integrity test system shall be established so that passage of particles greater than 3.0 microns or larger can be detected.

3) The un-pressurized side of the membrane unit will be vented to atmospheric pressure.

4) The Seller shall provide documentation of methodology used to establish the integrity test pressure.

5) The integrity test system shall be manually or automatically initiated and automatically sequenced by the PLC system, and complete daily in conformance with the US EPA Long Term 2 Enhance Surface Water Treatment Rule and the Membrane Filtration Guidance Manual.

6) The integrity test system shall verify the integrity of the membrane and upon successful completion of the integrity verification, return the Unit to service.

7) If the integrity test does not pass the integrity verification, the Unit shall be removed from service and an alarm shall be annunciated from the Unit PLC / Remote I/O to the System PLC.

8) Refer to Section 01 74 00, Membrane System and Module Warranty for additional requirements of the Membrane Integrity Test System.

C. Fabrication Requirements

1. All welding shall be in accordance with the latest applicable codes of the American Welding Society and/or ASME Boiler Code.

2. Piping

a. Schedule 10S Type 316L stainless steel pipe assemblies may be used.

b. Refer to Section 15 06 20, Stainless Steel Pipe and Tubing for stainless steel fabrication.

c. Threaded fittings shall not be used for pipe diameters exceeding 2 inches IPS.

d. Each membrane valve or piping assembly shall be tested at the Seller's facility using dummy module. This testing shall incorporate a leak check to verify the integrity of the welded and bolted connections and will be repeated in the field using the actual modules. If the Seller elects to forgo this test and a weld failure is discovered during the field rest, the Seller shall be responsible for all costs associated with the requisite repairs and associated delays.

3. Unit Frame Construction

a. The unit support frames and miscellaneous brackets shall be fabricated from ASTM A36 hot rolled steel structural members and ASTM-A500, Grade B welded steel structural tubing.

1) The method of fabrication shall be continuous fillet and bevel welds. The strength of these welds shall meet or exceed the strength of the structural shape or tubing material. All welding operators shall be qualified in accordance with the current AWS requirements. All exterior welds shall be ground flush and smooth prior to sandblasting. Metal Inert Gas (MIG) welding techniques shall not be used in the frame fabrication. Stitch and spot welding will not be accepted. Bolt holes, mounting holes, etc., shall be drilled prior to painting wherever possible.

b. Painting

1) Refer to Section 09 90 00, Painting.

2.03 EQUIPMENT AND COMPONENTS

A. Component Equipment Requirements

1. Component equipment provided by the Seller shall conform to the requirements of the Contract Documents.

2. The Seller may use NSF / FDA / USDA approved plastic material for module assemblies that are replaced with the membrane modules. All materials of construction shall use NSF / FDA / USDA approved materials for contact with water.

3. Centrifugal Pumps

a. Process Design Requirements

1) Pump sizing and calculations shall be finalized with submittal drawings for the membrane system.

2) Pumps shall be sized using the Seller design criteria and will accommodate the maximum number of membrane modules per membrane unit assembly as indicated in the Proposal Pricing Form.

b. Service Condition

1) Membrane feed pumps

2) Backwash pumps

3) CIP recirculation pump

c. Design Criteria

1) Process Design Requirements

a) Pump sizing and calculations shall be finalized with submittal drawings for the membrane system.

b) Pumps shall be sized using the Seller design criteria and will accommodate the maximum number of membrane modules per membrane unit assembly as indicated in the Proposal Pricing Form.

d. PUMP REQUIREMENTS

1) Construction: Construction of centrifugal pumps shall conform to the following requirements:

2) All elastomeric materials such as O-rings and gaskets shall be compatible with the fluid.

3) Coating: Interior water passages of cast iron and ductile iron casing shall be coated with 10- to 12-mils DFT vitreous enamel or 10- to 12-mils DFT fusion bonded epoxy per Section 09 96 00, Painting. All external surfaces of cast iron and carbon steel materials shall be coated in accordance with Section 09 90 00, Painting. Stainless steels shall not be coated.

e. MOTOR

1) Motor shall operate on 460 VAC, 3 PH, 60 Hz power supply.

2) Motor shall be TEFC-type with worm gear reducer.

3) Motors shall have a 1.15 service factor and shall be NEMA Design B, with Class F insulation. Motors shall have space heaters to prevent condensation in the motor. Conduit boxes to be two times NEMA standard. Provide separate boxes for motor leads and for space heater and temperature switch wiring.

4) Each pump and motor shall be furnished with a stainless steel nameplate securely mounted to the body of the equipment which will list manufacturer and model details, and relevant design criteria.

5) VARIABLE FREQUENCY DRIVE

a) Requirements:

(a) The power and control electronics shall be housed in a UL Type 3 enclosure and the combined motor/VFD rating shall be IP55 (protection against dust and nozzle directed water from any direction) or be NEMA 4 rated.

(b) The VFD shall be of the PWM (Pulse Width Modulation) design using IGBT (Insulated Gate Bipolar Transistor) technology.

(c) The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of motor. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor current suitable for centrifugal pump control and to eliminate the need for motor de-rating.

(d) The VFD shall automatically reduce the switching frequency and/or the output voltage and frequency to the motor during periods of sustained ambient temperatures that are higher than the normal operating range. The switching frequency shall be reduced before motor speed is reduced.

(e) An integral RFI filter shall be standard in the VFD.

(f) The VFD shall have a minimum of two skip frequency bands which can be field adjustable.

(g) The VFD shall have internal solid-state overload protection designed to trip within the range of 105-110% of rated current.

(h) The integrated VFD motor shall include protection against input transients, phase imbalance, loss of AC line phase, over-voltage, under-voltage, VFD over-temperature, and motor over-temperature. Three-phase integrated VFD motors shall be capable of providing full output voltage and frequency with a voltage imbalance of up to 10%.

(i) The VFD motor shall have, as a minimum, the following input/output capabilities:

(j) Speed Reference Signal: 0-10 VDC, 4-20mA or Ethernet

(k) Digital remote on/off, or Ethernet

(l) Fault Signal Relay (NC or NO), or Ethernet

(m) Fieldbus communication port (Ethernet IP)

f. APPROVED MANUFACTURER

1) Grundfos

2) Goulds ESH

3) or approved equal

4. Air diaphragm pumps

a. Air diaphragm pumps will be designed for the following services:

1) 12.5% Sodium Hypochlorite

2) 1% Caustic Soda

3) 2% Citric Acid

4) Calcium Thiosulfate

b. Pump Construction:

1) General: The pump shall be of the air-operated double diaphragm type and conform to the following requirements:

| | |
|---|---|
| Pump base | cast iron / steel / aluminum |
| Pump casing (wetted) | PVDF |
| Pump casing (dry) | Polypropylene |
| Pump construction | clamped |
| Diaphragms | Santoprene / PTFE / Buna-N |
| Check valves | ball checks |
| Check valve material | PTFE |
| Valve seats | PVDF / Polypropylene |
| Valve seat O-rings | Santoprene / PTFE / Buna-N |
| Pump shaft | 316 stainless steel / nitrided carbon steel |
| Air control valve | self-lubricated or oil-lubricated |

c. MANUFACTURERS OR EQUAL

1) Wilden / PSG, or approved equal

5. Compressed Air System

a. Air Compressors:

1) Compressors shall be Oil Lubricated Rotary Screw type, direct driven complete with inlet filter / silencer, discharge check valve, motor, and automatic pressure unloader, providing no load starting.

2) Each compressed air module shall consist of, but not necessarily be limited to, the following: compressor, drive motor, oil system, air system; electronic regulating controls, sound attenuating enclosure, starter cubicle and integrated refrigerant air dryer.

3) Compressors of oil type shall use food grade lubricants if used in direct contact with potable water, such as air scour or integrity testing. The oil lubrication system installed with each module shall be of the differential pressure type consisting of an ASME approved air/oil separator unit including, but not limited to, the following: separator element; oil fill tube; oil level indicator; oil filter of the spin-on type rated at 10 microns; oil cooler; and thermostatic oil cooler bypass valve.

4) Air handling systems installed with each module shall consist of the following: dry type air intake filter rated at 3 microns; pneumatically operated air intake valve/unloader assembly; minimum pressure/check valve; air/oil separation system; discharge air shutoff valve; and motor driven compressor cooling fan.

5) Each air compressor module shall have a compact welded aluminum combination cooler, and a moisture separator/trap including both automatic and manual drain lines.

6) The compressor shall be enclosed by sound attenuated panels designed to limit noise to a maximum of 76 dB(A).

7) Compressors shall use an air-cooled heat exchanger.

8) Provide compressed air equipment from one of the following manufacturers:

   (a) Atlas Copco Series GA

   (b) Atlas Copco Series ZT

   (c) Ingersoll Rand SSR

   (d) Ingersoll Rand 2340L5

   (e) Kaeser

b. Refrigerated Air Dryers:

1) An integral refrigerated dryer shall be furnished with each compressor module. Each dryer shall Include the following pre-cooler/reheater, refrigerant compressor; liquid separator; press-o-stat regulator of condenser fan operation; expansion valve; R22 refrigerant; and pressure dew-point indicator monitored through the control module.

2) Rate air dryers in accordance with the standard rating conditions of the National Fluid Power Association for class H dryers, i.e., 33 to 39 degrees F pressure dewpoint range at the specified minimum discharge pressure and 100 degrees F inlet air with a maximum pressure drop of 5 psi.

3) Under this rating, provide the dryers with a capacity not less than 20 percent above the maximum total free air delivery of each dedicated air compressor,

4) Equip each refrigerated air dryer with a condensing unit, refrigerant evaporator, mechanical separator automatic condensate discharge valve, high discharge air temperature alarm light, and switch for actuating a remote alarm, prefilter, and afterfilter. The air dryer shall be integrated into the compressor design and part of the compressor enclosure.

5) After-filter: Equip dryers with filters to remove oil, carryover, oil aerosols and other foreign matter. Install a prefilter near the dryer inlet and install an afterfilter near the dryer discharge. Design the prefilter for mechanical removal of solid and liquid particles, equipped with a porous bronze filter element with a 5 micron rating. Provide an afterfilter of the coalescing type with a 0.5 micron rating.

6) Acceptable Manufactures: Provide refrigerated air dryers from one of the following manufactures:

a) Atlas Copco

b) Ingersoll Rand

c) Kaeser

c. Air Receivers and Air Surge Tank:

1) The air receiver shall be a vertical tank of all welded, carbon steel construction with semi-ellipsoidal heads and leg supports for mounting on a concrete base. The receiver shall be designed and constructed in accordance with the ASME Code for Unfired Pressure Vessels and shall bear a code stamp.

2) Receivers shall be complete with a pressure transmitter, pressure, gage, pressure relief valve, automatic drain valve, and appurtenances. Receivers and surge tank shall be provided with an internal factory applied epoxy lining.

3) The minimum receiver size is 60 gallons. The minimum pressure rating is 200 psig.

4) The receiver shall be provided with piping connections for an inlet, outlet, drain, pressure relief valve, and cleanout opening.

5) The receiver shall be suitable for installation outdoors on a concrete pad. The manufacturer shall submit calculations documenting compliance of vessel support and recommended anchorage according to Section 01 33 17, Structural Design, Support, and Attachment.

6) Manufacturer

a) Hanson

b) Manchester

c) Brunner

d. Coalescing Filters:

1) Coalescing type oil removal filters shall be provided. The filters shall remove 99.995% of the solids and liquids 0.3 micron or larger in size with replaceable filter elements. Filters and housings shall be sized and selected by the Seller to meet requirements of the system.

2) Supply air filter assemblies shall be provided by the Seller for each compressor. Each assembly shall include the following: filters (3); filter support bracket; outlet ball valve; auto drain valve assemblies (3).

3) The Seller shall provide support brackets with cutouts to the filter housings. The support brackets shall be constructed of Type 304 stainless steel and shall contain labels for the filter housings as well as inlet and outlet sides of the assemblies.

4) Differential pressure indicators shall be provided for the filter assembly.

5) Manufacturer

a) Pall - Filterite

b) Ingersoll Rand

c) Zeks

d) Atlas Copco

e. Particulate or Membrane Air Filters:

1) For air that is in intimate contact with filtered water, hydrophobic membrane particulate filters with an absolute range of 0.02-micron removal shall be provided. The filters shall have replaceable cartridges. Filters and housings shall be sized and selected by the Seller to meet requirements of the system.

2) Air filters with a 1-micron removal rating instrument air and valve actuation.

3) Differential pressure indicators shall be provided for the filter assembly.

4) Manufacturer

a) Pall - Filterite

b) Millipore

c) Parker

d) Zeks

e) Atlas Copco

f. Air Regulator Assembly:

1) Provide an air regulator assembly consisting of inlet valves, pressure relief valve, air muffler, pressure indicator, and outlet valve at the receiver outlet. Provide an installed spare air regulator assembly identical to the above.

2) Air regulators at each air source is acceptable in lieu of a regulator assembly.

3) Individual control air regulator assemblies shall be installed as shown on the Drawings.

4) Air filters shall be furnished complete with housing, support bracket, and removable filter cartridge. The support bracket and associated hardware shall be Type 304 stainless steel. Filters and housings shall be sized and selected by the Seller to meet requirements of the system.

5) Manufacturer

a) SMC

b) Norgren

c) Cashco

g. Fabrication Requirements (Materials of Construction)

1) All mounting hardware shall be Type 304 Stainless Steel.

6. Automatic Self-Cleaning Strainers

a. Strainers shall be of the motorized automatic self-cleaning type. The equipment shall be designed to continuously remove suspended particles from the pumped raw water.

b. Construction

1) Strainer shall be of the self-cleaning type, on-line style. It shall consist of an outer carbon steel with potable grade interior epoxy coating, cast-iron or ductile iron body, an internal 316 stainless steel screen element sealed with an upper and lower seal ring, and a rotating, backwash arm that discharges the backwash water through an outlet nozzle.

2) The use of carbon steel for any wetted strainer surfaces is not acceptable under any circumstance.

3) Backwash cleaning of the screen is accomplished by utilizing the pressure differential between strained water discharge pipe and atmospheric pressure. Backwash cycles can be initiated on an operator adjustable differential pressure set point or on a time cycle. Process flow shall remain completely uninterrupted during the backwash cycle.

4) The Seller is responsible for verifying the membrane system design will have adequate backpressure to achieve the minimum backwash supply pressure as required by the selected strainer manufacturer.

5) The unit shall be designed so that the entire operating assembly, motor, gear reducer, cover, backwash and assembly, screen element, and bearing housing, lift from the filter body as a complete unit.

6) The strainer shall be rated for service at 150 psi @ 100°F and ASME code stamped. Inlet and outlet connection shall be flanged and designed and constructed in accordance with both ANSI and ASME Section VIII, Division 1.

7) An inspection port shall be provided to permit visual inspection of filter element without removing drum.

8) A drain opening shall be provided in the lower part of the strainer body to permit drainage without removing drum.

9) The straining element shall be 316 stainless steel with 300 micron screen size. The Seller may require a smaller retention efficiency of the strainer for protection of downstream equipment. Wedge wire or slotted screens are not acceptable.

10) If the raw water pressure is not sufficient to backwash the strainer, the strainer shall be modified to use filtered water for backwashing of the strainer. The design and operating capacity of the membrane system shall be increased by 1 percent to account for strainer backwash water losses.

11) The motor shaft shall be sealed by a drip-proof mechanical seal. The use of packing or any other sealing arrangement is not acceptable under any circumstance.

c. Motor:

1) Motor shall operate on 460 VAC, 3 PH, 60 Hz power supply.

2) Motor shall be TEFC-type with worm gear reducer.

d. Spare Parts:

1) The following spare parts shall be furnished:

2) One set of replacement filter media for strainer.

e. Manufacturers:

1) Amiad

2) Fluid Engineering.

3) Kinney.

4) Forsta

7. Containerized membrane system control system

a. A master control panel in a NEMA 4 painted mild steel wall mounted enclosure shall be furnished by the manufacturer of the ultrafilter system for each containerized unit provided. The control panel shall be wired to accept a 120 volt power feed. The filter control system shall be manufactured in a UL508A/ 698 certified panel shop.

b. The control panel shall be capable of communicating with the main Water Treatment Plant's GE/Emerson PLC system through a suitable protocol converter. All process data, alarms, operator controls, and process setpoints shall be made available to be read and written by either the Alder Creek Main PLC or the Alder Creek SCADA system.

c. A master control panel in a NEMA 4 painted mild steel enclosure shall be furnished to provide communication between each supplied containerized unit and the neutralization system.

d. The control panel shall incorporate an Allen Bradley CompactLogix Programmable Logic Controller (PLC) for accomplishing the control logic. The PLC shall be connected to the plant network via an Ethernet communication link. Communication protocol shall be Ethernet I/P. The panel shall have the capability to be accessed remotely via the plant Ethernet network through an integrated VPN connection.

e. A 19" Allen Bradley AdvanTech Panel PC with Factory Talk View ME color touchscreen graphical operator interface shall be provided in the PLC panel for viewing system status and entering operator selected functions and operating variables.

f. The PLC shall be supplied with a minimum of 20% spare I/O that is to be prewired out to the terminal strip for future for plant integration. The PLC shall incorporate the proper quantities of the following components to make a complete operational system.

g. I/O can be from Allen Bradley, Numatics or Wago as per the vendor's preference.

h. The control panel shall be provided with all necessary fuses, relays, circuit breakers, power distribution blocks, 24 vdc power supplies, and Ethernet VPN router to make a complete and operational system.

i. All wiring shall be brought to a terminal strip for interface with external devices. Terminals shall be cage type with screw terminal connection. No more than two wires shall be connected to one terminal. Multi-level terminals are acceptable. Terminals shall be manufactured by Phoenix Contact or equivalent.

j. The control system shall allow for automatic control of all functions of the ultrafilter process. There shall also be manual control of all equipment via the operator interface.

k. The control system shall be designed to allow for integration with the existing equipment onsite and shall have the ability to interface with the existing level instrumentation and feed water supply pumps.

l. The control panel shall be provided with a properly sized control power transformer. This transformer is to have both primary legs and one secondary leg fused.

m. Local distributed I/O panels or NEMA 4 integrated blocks (without panel) shall be provided for the ultrafiltration trains and CIP skid. The panels/blocks shall be NEMA 4 painted mild steel and will be skid mounted. The control panels will house Allen Bradley Flex I/O or Emerson Numatics integrated racks to interface back to the master control panel. The panels will be supplied with a manifold system to distribute the required service air to the appropriate skid mounted automated valves. This manifold shall be provided with the proper quantities of solenoid valves rated for control of the skid mounted control valves. A combination regulator / filter shall be provided within the control panel to ensure that clean air is supplied to the manifold at the proper pressure.

8. Valves

a. Automated Butterfly Valves

1) For valves that are in locations where reliability is a consideration, or for automated valves that automatically modulate for flow control or actuate with periodic backwashing or other Seller- designated terminology describing the reversal of periodic flow through the membrane system that occur at design intervals of less than 2 hours, the Seller will provide resilient seated valves.

2) Valves shall provide ANSI Class VI shutoff

3) Materials of Construction

a) Body: 316 Stainless Steel

b) Disc: 316 Stainless Steel

c) Shaft: 17-4PH SS or 316 Stainless Steel

d) Pins: 316 Stainless Steel

e) Seats and Seals:

(a) Water Service-EPDM

f) Compressed Air - Teflon - PTFE

g) Process Air - Fluorocarbon (Viton, RTFE, or Fluorinated Hydrocarbon Elastomer - ASTM D1418) rated for 300 degrees minimum or higher if required by process.

h) Backing Ring: Stainless Steel

i) Bushing / Bearings: EPDM or RTFE

j) Packing: PTFE

4) Throttling or rate of flow control valves may be of the butterfly type. The Seller shall submit calculations to verify that valve cavitation does not occur over the operating range of the valve.

5) Bolting Pattern - Lugged valves shall be used.

6) Acceptable manufacturers:

a) Keystone - K-Loc High Performance Butterfly Valve - F362

b) DeZurik- High Performance Butterfly Valve

c) Flowseal (John Crane) - Soft Seat High Performance Butterfly Valve

d) Jamesbury - Wafersphere - High Performance Butterfly Valve

e) Fisher - PosiSeal

f) Masoneilon Dresser - High Performance Butterfly Val

g) Bray, 31 Series

b. General Service

1) Service Conditions - General Service – less than 30 inches in diameter:

a) One Piece Body

(a) Unless otherwise specified or approved by the Engineer, all valves shall be lugged style.

(b) Body: 1 piece cast iron or ductile iron body

(c) Disc: 316 Stainless Steel

(d) Stem: 316 or 416 Stainless Steel

(e) Bushings: PTFE

(f) Pins: Stainless Steel

(g) Seats and Seals:

(i) Water Service – EPDM, Viton

(ii) Compressed Air - Teflon – PTFE, Viton

(iii) Process Air - Fluorocarbon (Viton, RTFE, or Fluorinated Hydrocarbon Elastomer - ASTM D1418) rated for 350 degrees minimum or higher if required by process.

(h) All valves shall be furnished with two upper and one lower bearings/bushings of PTFE material. Shaft seals shall be provided to prevent leakage and to protect bearings from internal or external corrosion.

(i) Valve seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall also act as a body liner to prevent flow from contacting the body casting. Seats shall have flange sealing to provide a positive seal without use of flange gaskets.

(j) Valves shall have a dead-end shutoff differential pressure rating equal to or greater than 50 psig (with flanges installed on each valve face). Valves to be suitable for and rated for full vacuum service.

(k) Body wall shall exceed requirement for AWWA C504 Class 150 standard.

(l) The disc shall be secured to the shaft using at least two Type 316 stainless steel pins or self- locking setscrews.

(m) Valves shall have the ability to be installed with the disc in the closed position.

(n) Valves shall be suitable for process air or vacuum service.

(o) Factory Testing: Test shall be conducted on each valve in accordance with manufacturer's Quality Control procedures.

(p) Acceptable Manufacturer

(i) DeZurik –Type BRS.

(ii) Centerline Model 200/225

(iii) Keystone 602.

(iv) Bray Series 70

(v) Bray Sries 92

b) Two Piece Body

(a) Butterfly valves 2-inch to 12-inch shall be flange, lugged style, 150 psi class butterfly valves using a 2-piece cast iron body and 316 stainless steel paddle.

(b) Valve seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall have flange sealing to provide a positive seal without use of flange gaskets.

(c) Valves shall be 316 stainless steel. Shaft diameter shall be suitable for 150 psi service (2 to 12 inch valves).

(d) Discs shall be 316 stainless steel and use a thin profile disk. The disc-to-shaft connections shall be Type 316 stainless steel.

(e) Pins, shaft, and disc of all valves shall be individually machined and completely interchangeable.

(f) Valves shall be compatible with the fluids in contact with the valve at a maximum temperature of 110°F.

(g) Factory Testing: Test shall be conducted on each valve in accordance with manufacturer's Quality Control procedures.

(h) Acceptable Manufacturer

(i) Keystone – Resilient Seated Valve Type 920

(ii) Or-Equal will not be accepted (use 1 piece body valve).

c. Type 3 Butterfly Valve

1) Service Conditions - Backwash chlorine solution and other concentrated chemical or cleaning solution in contact with the valve.

2) Valves 1" and above in contact with chlorine solution above 50 ppm or other cleaning solution where stainless steel is not appropriate for contact shall use a flanged, lugged style, 150 psi butterfly valves using cast iron body and Teflon coated disc with a replaceable valve seat.

3) Acceptable manufacturers and models.

a) Keystone - Resilient Seated Valve Types 920

b) DeZurik - Resilient Seated Valve Type BGS

c) Bray Series 22/23

d. Stainless Steel Isolation Ball Valves

1) Stainless steel isolation ball valves are required for pressure gauges, pump casing drains and other locations as shown on the Drawings.

2) The Ball Valve shall consist of a type 316 stainless steel body, a polished stainless steel ball and a Teflon seat. The valve shall be equipped with a lever type handle. The valve shall have a minimum working pressure of 800 psi WOG (Water-Oil-Gas)

3) Ball valve of 2 inches or less shall have NPT threads, Ball valves used in caustic service or in applications larger than 2-inches shall have flanged end connections.

4) Provide double acting pneumatic actuators using the same manufacturer of the valve, if required for valves less than 1-inch in size.

5) Acceptable Manufacturers

a) Apollo Type 76

b) Watts Type S-8100 and S-8000

c) Whitey (Swagelok) Series 40

d) Parker H-series

e) Flow-Tek

f) John Guest

e. PVC Plastic Ball Valves

1) PVC or CPVC Plastic Ball valves shall use a True Union Design.

2) The elastomer shall be compatible with the chemical service.

3) Acceptable Manufacturers·

a) Spears

b) Nibco - Chemtrol

c) Asahi -Duo Block

f. Brass Ball Valves

1) Description: Three-piece brass ball valve, in sizes up to 2-inches

2) Operating Conditions: Install where noted or shown

3) Design Requirements:

4) Maximum Operating Pressure: 600 psig

5) Rated Operating Temperature: 200°F

6) End Connections: 600 WOG, conforming to MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

7) Actuator: Manual, lever type

8) Materials:

a) Body: Brass, ASTM B30 - Standard Specification for Copper Alloys in Ingot Form

b) Ball: Hard Chrome plated brass ball

c) Stem: Brass, ASTM B30 - Standard Specification for Copper Alloys in Ingot Form

d) Seats: Glass reinforced Durafil

e) Seals: PTFE

f) Bolting: Type 316 stainless steel

9) Manufacturers:

a) Watts Series B-6000

b) Apollo

g. V-Notch Ball Valves

1) Ball valves suitable for throttling are required for general water service as shown on the Drawings,

2) Materials:

a) Body: 316 Stainless Steel

b) Ball: 316 Stainless Steel

c) Shaft (Stem): 17-4 PH or 316 stainless steel.

d) Actuator: The ball valves shall have provisions for mounting an actuator, positioner, and valve position feedback module.

3) Acceptable Manufacturers

a) Worcester Controls V-Seat

b) DeZurik VPB

c) Fisher Vee-Ball

h. Type 1 Check Valve – Globe Style

1) Size and Extent: Membrane Raw Water Pump Discharge, as shown on Drawings.

2) Working Pressure: 150 psi

3) Silent operation check valves. The operation of the valve shall not be affected by the position in the pipeline. The valve disk shall be concave to the flow in the pipeline and guided by center shaft. The globe style check valve shall have an open area equal to or greater than the pipe diameter. Valves 10- inch and smaller shall be capable of mounting directly to a butterfly valve.

4) Check valve shall be spring loaded, normally closed by means of a heavy-duty center guided, stainless steel springs. Flow from the pumps shall cause the valve to open and upon pump shut down, the spring will shut the valve before reverse flow starts and at a point of zero velocity of non-slam closure.

5) Valve body shall be cast or ductile iron. Valve seat and disk will be Bronze. Seating shall be resilient and watertight. The sealing element shall be EPDM or Viton (Buna-N is not acceptable) and provide zero leakage. The torsion spring shall be stainless steel. All component parts shall be field-replaceable.

6) Manufacturers:

a) Valmatic, Type 1800

b) Apco, Model 600

c) Golden Anderson, Model 280 or 288

i. Double Disc or Double Door Style Check Valves

1) Service Conditions: Pump Discharges

2) Body: 316 Stainless Steel if in contact with crp

3) Body: Ductile iron if not in contact with crp

4) Seat and Bushings: 316 Stainless Steel

5) Spring and Screws: 316 Stainless Steel

6) Seals:

a) Water: Viton, EPDM (Buna-N is not acceptable)

b) Process Air: Fluorocarbon (Viton, RTFE, or Fluorinated Hydrocarbon Elastomer ASTM D1418) rated for 350 degrees minimum or higher if required by process.

7) Manufacturers:

a) Valmatic, Model Dual Disc

b) Centerline, Model 800

c) APCO, Model 900

j. Check Valve

1) Service: as indicated on Drawings

2) Style: Plastic Ball Check Valve

3) Manufacturers

a) Nibco - Chemtrol

b) Asahi

c) Spears

k. Check Valve

1) Service: Instrumentation and Sample Lines

2) Style: Diaphragm Check Viton Elastomer

3) Material: PVC

4) Manufacturer

a) Plastomatic

l. Check Valve

1) Service: Vacuum Line

2) Style: Swing Check, Threaded End Connections

3) Material: Stainless Steel Type 316

4) Manufacturer

a) Truline

b) Sure-Flow

m. Check Valve

1) Service: Water/Air, I-inch

2) Style: Poppet Check, Tube or NPT fittings

3) Material: Stainless Steel Type 316

4) Manufacturer

5) Swagelok C Series

6) Check Valve

7) Service: Water/Air, I-inch

8) Style: Poppet Check, Tube or NPT fitting

9) Material: Brass Type 360/316

10) Manufacturer

a) Swagelok C Series

9. Valve Actuators

a. Pneumatic Valve Actuator Operators

1) Service Conditions: General Service Quarter Turn Butterfly and Ball Valves

2) Cylinder actuators shall have working mechanism fully enclosed, and shall be sized for operation using 80 psig pneumatic supply. Cylinder actuators shall have pilot valves where indicated on the drawings. Units shall have adjustable end position stops. All valve actuators shall include proximity type limit switches. Limit switches shall be programmed to register the open and closed positions. Tubing connecting valve mounted solenoids to the actuator shall be type 316 stainless steel.

3) Pneumatic actuators shall be capable of producing a minimum of 1.5 times the required operating torque.

4) Materials of Construction:

a) Actuator Body and End Caps: Aluminum

b) Piston: Aluminum

c) Seals: Nitrile or EPDM

d) Pinion Shaft: Stainless Steel

5) Special Valve Actuator Finish: The exterior finish of the valve actuation shall be provided with a special corrosion resistant finish to resist unanticipated or accidental spray of acid, base or oxidants. Acceptable finishes include:

a) epoxy coating

b) electro-less nickel. Anodized aluminum shall not be used for the exterior finish of the valve actuator.

6) Provide valve disc position indicator on operator.

7) Acceptable Manufacturers

a) Keystone 1Morin Type MRP

b) DeZurik - Compak II

c) John Crane - Centerline Series 33000/38000

d) Jamesbury - Type ST or SP

e) EL-O-Matic

f) Bray Series 70

b. Electric Valve Actuator:

1) General: Electric motor operators shall be furnished complete with motor, extension bonnet, torque tube, position indicator, integral reversing starter, and controls specified herein. All components shall be entirely suitable for outdoor service.

2) Electric motor operators shall conform to AWWA C504, except as specified herein.

3) Electric motor operators shall be capable of producing a minimum of 1.5 times the required operating torque.

4) Voltage: 110 VAC, 60 Hz, 1 phase. Provide for 110 volt control power or 24VDC, 4-20 mA control signal as required and as shown on drawings.

5) Enclosure: NEMA 6 (IP 68)

a) Non-intrusive entry with no mechanical parts penetrating the control enclosure of the actuator.

b) Double O-ring seals

c) Separately sealed terminal compartment.

6) Mounting Hardware: Provide extension bonnet, torque tube and bonnet supported floor stand for mounting each electric operator on valve with shaft vertical in horizontal pipeline.

7) Controls:

a) Provide dry contacts for remote indication of:

b) Ready to operate-control voltage available, fuses and overloads intact

c) Valve full open

d) Valve full closed

8) Display: Provide LCD Display of valve position, calibration and diagnostics.

9) Starter: Provide reversing contactor III NEMA 4 enclosure integrally mounted on operator.

10) Thermal Protection: Provide winding thermal protection.

11) A feedback position transmitter shall be supplied with each modulating service valve.

12) Provide valve disc position indicator on operator

13) Manufacturer:

a) Rotork IQ

b) Limitorque MX

10. Flexible connections shall be provided at piping terminations as shown on the Drawings. Use materials approved for potable water. Buna-N elastomers are not acceptable. The stainless steel expansion retaining rings shall be supplied with stainless steel control rod assemblies.

a. Manufacturers

1) Red Valve Type J-1

2) Proco

3) Mercer Rubber

4) Uniroyal

11. NEUTRALIZATION SYSTEM

a. Neutralization Container: One neutralization system shall be provided that is sufficiently sized for neutralization of chemicals used in the maintenance clean and clean-in-place processes. The container shall include a neutralization pump, tank, chemical metering pumps, pH transmitter, electrical junction box, and all valves and piping necessary for operation. The system components shall be mounted in either a shipping container or skid mounted.

1) Neutralization Recirculation Pump: The neutralization recirculation pump shall be a vertical multi-stage centrifugal pump with a stainless steel housing impeller and shaft as manufactured by Goulds, Grundfos, or equal. The pump shall be supplied with pressure gauges and valves as required.

2) Neutralization Chemical Metering Pumps: All necessary metering pumps shall be supplied for feeding liquid sodium bisulfite and sodium hydroxide from chemical totes into the neutralization skid recirculation piping. The pumps shall be solenoid or motor driven, positive displacement pumps as manufactured by Prominent. Pumps shall be supplied with heads, diaphragms, check valves, foot-valves and isolation valves all compatible with the solution being pumped. The pumps shall be controlled by the UF electrical panel. A shelf shall be supplied on this skid to support the metering pumps above the chemical storage totes (by others).

3) Neutralization Tank: The neutralization tank shall be a closed top, white translucent HDPE tank of sufficient size to contain the chemical waste from any chemically enhanced backwashes, maintenance cleans, or clean-in-place cycles, with sufficient volume to capture and neutralize all chemical waste. The tank shall be supplied with inlet, outlet, and overflow connections. Tank shall have level transmitter and drain connections.

b. In lieu of a containerized or skid mounted neutralization system, a neutralization system located inside the containerized unit will be also be sufficient with all components listed in 11.1.a. Those system components can also be used for other system uses when not performing neutralization of CIP and other waste streams.

2.04 SPARE PARTS

A. Spare Parts for Membrane Filtration Equipment shall be in accordance with Section 01 75 00, Spare Parts.

2.05 SPECIAL TOOLS

A. The Seller shall provide special tools required for disassembly and reassembly or analysis of membrane modules.

B. The Seller shall provide all lifting assemblies, hooks, straps, cables and accessories for removing the membrane modules from the rack assemblies.

2.06 LUBRICANTS

A. Refer to Section 01 73 00, Installation, Operation and Maintenance Manuals for Safety Data Sheet submittal requirements.

**PART 3 -- EXECUTION**

3.01 INSTALLATION

A. Refer to Section 01 62 00, Installation of Membrane Equipment.

3.02 COMMISSIONING

A. The Seller is responsible for the complete commissioning of the MF system after the Notice of Completed Installation.

B. Refer to Section 01 66 00, Commissioning of Membrane Equipment.

3.03 TRAINING

A. Refer to Section 01 73 10, Training of Operations and Maintenance Personnel.

3.04 ACCEPTANCE TESTING

A. Refer to Section 01 67 00, Acceptance Testing of Membrane Equipment.

3.05 OPERATIONAL ASSISTANCE

A. Refer to Section 01 68 00, Operational Assistance.

END OF SECTION

# SECTION 11 30 20 PERFORMANCE PILOT TESTING OF MEMBRANE EQUIPMENT

## PART 1 -- GENERAL

1.01 SUMMARY

A. General:

1. The Seller shall provide a fully integrated and containerized water treatment pilot system that includes feed tank, feed pumps, autostrainers, a MF/UF system with cleaning systems, filtrate pumping, microprocessor controls with panelview HMI, and cellular communications for utilization during the Buyer's 90-Day Pilot Study.

2. The Seller shall provide dispersed equipment including a submersible pump for raw water pumping, a flow paced coagulant feed system, a neutralization / dechlorination system for all waste cleaning solutions.

3. Power shall be 480 volt, 3 phase.

4. Performance Testing shall be conducted per the Pilot Performance Testing Protocol by the Seller (see Exhibit A) as-approved by the Buyer.

5. Pilot results will be used to confirm the basis of design and operating guarantees submitted by the Seller in its Procurement Proposal Evaluation and to obtain OHA approval of the Membrane System.

6. Performance Testing will occur at the City of Sandy's Alder Creek Water Treatment Plant Site which does not have a formal address. The Water Treatment Plant is located 7 miles east of Sandy near Terra Fern Drive.

B. Related Sections:

1. Division 00, Bidding Requirements, Contract Forms, and conditions of the Contract.

2. Division 01, General Requirements.

3. Section 11 30 00, Hollow Fiber Membrane Equipment.

4. Section 11 30 20, Exhibit A Pilot Performance Testing Protocol - 90-Day Pilot Study.

1.02 SUBMITTALS

A. See Specification 01 34 00 for requirements for the mechanics and administration of the submittal process.

B. Operations and Maintenance Manuals:

1. Provide all pertinent operations and maintenance (O&M) manuals for the pilot test unit with the Technical Information submitted with the Proposal.

C. Miscellaneous Submittals:

1. Drawing and Schematic:

   a. Provide an arrangement drawing and a process schematic diagram of the pilot test unit with the Technical Information submitted with the Proposal.

2. Pilot Work Plan:

   a. Submit a Draft Pilot Work Plan that addresses all of the objectives stated in the Pilot Performance Testing Protocol to the Engineer and Buyer per the schedule listed in the Agreement.

      1) Engineer and Buyer will review Draft Pilot Work Plan and provide Seller with comments and revisions.

      2) Incorporate comments and revisions into Final Pilot Work Plan

3. Example report:

   a. Submit for approval an example pilot test report indicating the data collection and reporting that will be performed.

4. Weekly meetings:

   b. Conduct weekly virtual meetings including Seller project manager and Pilot leader with Buyer's team.

   c. Provide graphical and narrative results of the pilot test with more than 24 hour lead time before the meeting to allow Buyer and Engineer review.

5. Pilot Report:

   d. Provide draft pilot report including a description of all pilot activities and data collected for Engineer and Buyer review.

      1) Incorporate Buyer and Engineer comments on the report.

   e. Produce a draft pilot report for OHA review and comment.

      2) Incorporate any OHA review comments on the report.

   f. Produce a final pilot report addressing all comments received.

**PART 2 -- PRODUCTS**

2.01 GENERAL

A. See Exhibit A for product information.

**PART 3 -- EXECUTION**

3.01 SEE EXHIBIT A

**11 30 20 EXHIBIT A**

**Pilot Performance Testing Protocol - 90-Day Pilot Study**

November 2023

Prepared for City of Sandy

by
Stantec Consulting Services, Inc.

## Table of Contents



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## PART 1 -- GENERAL

1.01 INTRODUCTION

A. The Seller will provide all labor and materials for execution of the pilot study except as noted.

B. The Buyer will install interconnecting piping, prepare level and gravel pads for equipment, arrange and pay for off-loading of equipment, provide all chemicals, pay for all power, provide labor for daily one-half hour checks of equipment.

C. The pilot study shall include:

1. Containerized pilot equipment including:

a. Feed tank / pumping

b. Autostrainers

c. Membrane Filtration

d. Cleaning systems

e. Filtrate tank / pumping

f. Microprocessor controls with panelview HMI

g. Cellular communications with remote access

2. Dispersed pilot equipment:

a. Raw water coagulant addition (flow paced)

b. Cleaning solution waste pH-neutralization and dechlorination system

## PART 2 -- PILOT PERFORMANCE TESTING PROGRAM

2.01 PILOT PERFORMANCE TESTING PROGRAM OBJECTIVES

The primary objectives of the *Pilot Performance Testing Program* is to confirm Seller's proposal and meet OHA's requirement for pilot testing membrane treatment systems prior to granting a construction permit.

2.02 PERFORMANCE CRITERIA

A. At minimum, the MF/UF System shall demonstrate the following during the pilot study:

1. Seller's proposal.

2. Meet finished water quality requirements listed in Table 1.

3. Operate at a recovery of at least 95 percent.

4. Meet criteria 1, 2, 3, and 4 while requiring clean in place (CIP) no more frequently than once every thirty days.

5. Demonstrate membrane integrity during the pilot test consistent with requirements of the Long Term 2 Enhanced Surface Water Treatment Rule.

6. Note: Feed water quality ranges to be used for MF/UF System design are summarized in Table 2 in Section 11 30 00, Hollow Fiber Membrane Equipment.

**Table 1 – Finished Water Quality Requirements**

| Parameter | Units | Requirement |
|---|---|---|
| MF/UF Water Quality Requirements | | |
| Total Iron | mg/L | ≤ 0.1 |
| Total Manganese | mg/L | ≤ 0.05 |
| Maximum Turbidity | NTU | < 0.1 |
| Color | Pcu | <1 |

2.03 PROCESS DESCRIPTION

A. See Section 11 30 00, Hollow Fiber Membrane Equipment and other Sections.

2.04 PILOT PERFORMANCE TESTING PROGRAM SCHEDULE OVERVIEW

A. The overall pilot evaluation will commence immediately following selection of a Seller. The pilot shall be operated 24 hours per day for a minim run-time period of 90 days excluding installation, startup, maintenance, and decommissioning; but including optimization and at least two 30-day design runs with fixed operating parameters. Liquidated damages and schedule are specified in Section 00 52 00, Procurement Agreement.

B. Pilot Preparation and Coordination

1. During pilot preparation and coordination, pilot shipment and laboratory contract arrangements will be made. A *Pilot Work Plan* (see Part 4) that addresses all of the objectives stated in Article.

2.1 will be created and agreed upon by all involved parties. Specific activities and corresponding responsibilities are listed in Paragraph 3.1.1.

C. Pilot Evaluation Phase I

1. Phase I is for startup and commissioning of the pilot system. This period will provide an opportunity for tuning of control systems, calibration of instrumentation, and implementation of the data collection procedures. Training of Buyer's staff will occur during this time period. The Quality Assurance program shall be initiated, including verification of data collection and reporting systems.

D. Pilot Evaluation Phase II

1. During Phase II, the MF/UF System will be run at the conditions as bid in the Proposal. All MF/UF System Design and Performance Criteria as specified in Article 2.2 in Section 11 30 00, Hollow Fiber Membrane Equipment, all applicable conditions bid by the Seller, and all performance criteria specified herein shall be met greater than or equal to 95 percent of the time throughout the duration of this phase for the phase to be deemed successful. Should the results indicate system performance capabilities that are less than this, see Article 5.05 in Section 00 52 00, Procurement Agreement.

E. Pilot Evaluation Phase III

1. During this phase, the Seller shall repeat Pilot Evaluation Phase II for confirmation.

F. Pilot Summary Report

1. At the conclusion of the pilot, a Final Pilot Summary Report will be generated. This report shall include, but not be limited to, an introduction of the existing treatment and pilot study; description of operation; presentation and discussion of results; conclusions and recommendations drawn from the study; and associated test data, tables, and graphs. The final report shall include information listed in Part 5.

2.05 PILOT UNIT (EQUIPMENT, CHEMICAL, AND ANALYTICAL) SPECIFICATIONS

A. **All equipment used to comprise the water treatment pilot system shall be less than 10-years old and be in good-working condition**. The overall pilot unit will include all pumps, tanks, compressors, chemicals, and other ancillary systems needed for full operation during the pilot testing. The pilot units shall be designed as self-contained systems that have their own raw water boost pump, air supply, and dryer for pneumatic valves, MF/UF chemical maintenance clean systems, control valves for adjusting production rate and recovery, pressure vessel assemblies designed for 95% recovery without backwash water recovery, instrumentation and controls for controlling the system and collecting the data on the process variable that effect performance and sample points for monitoring and collecting different process streams (Raw feed water, MF/UF filtrate, MF/UF backwash waste, final water (blended) for analysis. A PLC for automatic operation and alarm protections shall be provided. The Seller shall operate and maintain the pilot, not the Buyer.

B. The same MF/UF membrane modules and process conditions must be used in the test unit as proposed for the full-scale system, including membrane fiber, material, chemistry, and module construction. A proposed full-scale system, which employs membrane tanks/housings containing multiple modules/elements, may use membrane tanks/housings in the performance testing which contain fewer modules/elements, so long as the configuration accurately represents the hydraulic design of the full-scale configuration.

C. The various membrane filtration products operate in different manners, with different backwash techniques for maintaining performance. A complete description of the operation of each membrane system must be provided by the Seller in the *Pilot Work Plan* (see Part 4). These descriptions will become a part of the test data record.

D. Pilot System Checklist

1. A Pilot System Checklist is summarized in this paragraph. This list describes the membrane equipment and other ancillary systems to be supplied and installed by the Buyer and Seller. In general, the Seller shall be responsible for providing all interfaces needed to support the operation of the pilot unit.

2. Power Supply

    a. Seller shall furnish electrical requirements for pilot plant to Buyer.

    b. Buyer will provide power and connections for operation of pilot system.

    c. Buyer will install the electrical line disconnects from power source to the submersible feed pump and the pilot trailer under the direction of the Seller.

    d. Seller shall provide cellular communications and internet services required for the installation and operation of the pilot unit.

3. Water Supply

    a. Buyer will provide feed water at the pressure require for operation of the pilot.

    b. Seller shall determine feed piping size configuration, pump capacity, and requested discharge pressure needed to supply feed water to pilot system and provide drawings/schematics to Buyer.

    c. Buyer will supply the interconnecting piping for raw water supply to the pilot unit.

4. Waste Disposal

    a. Seller shall segregate backwashing waste from chemical wastes.

    b. Seller shall provide pH-neutralization and dechlorination system for waste cleaning solutions.

    c. Seller shall determine waste piping size and configuration needed to dispose of all pilot system (pretreatment, MF/UF) waste and provide information to Buyer.

    d. Buyer shall construct waste piping system.

    e. Buyer shall purchase chemicals and arrange for disposal of all unused chemicals at the end of the pilot test.

5. MF/UF Membrane System

    a. Seller shall supply and install an MF/UF pilot system. The MF/UF pilot unit shall:

        1) Produce sufficient volume of filtrate to be representative of full-scale unit performance.

        2) Operate at a minimum 95 percent recovery.

    b. Seller shall provide and install a break tank with sufficient volume (if needed to control and/or regulate flow).

c. Seller shall supply remote control and data acquisition system to operate and collect on-line data from the pilot unit using cellular service.

6. Chemicals

a. Buyer shall provide all chemicals needed during the duration of the Pilot Performance Testing Program. Chemicals include: pretreatment chemicals (coagulant), MF/UF system cleaning chemicals, chemicals needed to neutralize waste streams.

b. Buyer shall provide for disposal of any unused chemicals.

7. Analytical Equipment

a. Seller shall provide the following analytical instrumentation and supporting materials:

1) Handheld pH/conductivity meter with automatic temperature correction

2) pH standard buffer solutions (pHs 4, 7, and 10)

3) Conductivity standard solutions

4) Portable spectrophotometer or colorimeter that can measure UV254, Mn, and Fe

5) Reagents required to test for total and dissolved iron and manganese

6) Turbidity determination device

8. Integrity Testing

a. Integrity testing can be performed by either direct or indirect means.

1) Direct integrity testing will be accomplished through a pressure decay test.

2) Indirect integrity testing will be performed by monitoring permeate particle counts.

b. A test will be performed daily and at the completion of each CIP.

c. Damaged fiber shall be identified by the Seller to the Buyer and Engineer. After notification and examination by the Engineer, Seller shall repair damaged fibers.

## PART 3 -- PERFORMANCE TESTING CONDITIONS AND STANDARD PROCEDURES

3.01 RESPONSIBILITIES

A. Pilot Study Preparation and Coordination

1. Seller shall submit *Draft and Final Pilot Work Plans* to the Buyer and Engineer per the schedule listed in the Agreement. See Part 4 for a list of items to be included in the *Pilot Work Plan*.

2. Engineer will review pilot proposals and request additional information as needed.

3. Seller shall provide general liability and equipment insurance for the pilot system for duration of use including shipment of pilot system to and from pilot site. Proof of liability coverage shall be provided by Seller.

4. Seller shall provide a certificate of insurance for auto and workers compensation.

5. Seller shall coordinate shipment of pilot system to site and provide any required documentation for shipment.

6. Seller will contract with laboratory as necessary for sample analyses required per the *Pilot Work Plan*.

7. Seller will pay for all sample analyses.

B. Pilot Arrival

1. Buyer will provide access to pilot site and raw water supply.

2. Buyer shall receive pilot unit, unload it, and place it in the location for study.

C. Pilot Evaluation – Phase I

1. Seller shall install and connect all necessary components at the beginning of pilot study.

2. Seller shall provide an on-site technician for startup, training, and operation of the system for the duration of the pilot study.

D. Pilot Evaluation – Phases II, III, and IV

1. Seller shall follow the *Pilot Work Plan* agreed upon prior to commencement of pilot study.

2. Seller shall collect all samples as indicated in the *Pilot Work Plan*.

3. Seller shall contract with laboratory for outside analytical services and sample containers.

4. Buyer shall collect samples and arrange sample shipment.

5. Buyer shall inspect the pilot unit daily and make up chemical solutions.

6. Seller shall collect and provide all analytical results obtained during the pilot study to the Buyer and Engineer weekly.

E. Pilot Removal

1. Seller shall decommission pilot unit, package equipment, and pay for return shipment.

2. Buyer shall load equipment (all equipment provided by Seller) onto the truck or trailer for return shipment.

3. Seller shall coordinate return shipment of pilot unit and provide any required documentation for shipment.

4. Buyer will disconnect electrical service.

5. Buyer will remove and return interconnecting piping.

F. Pilot Evaluation Reports

1. Seller shall assemble, interpret, and summarize results of all pilot operational and analytical data and provide to Buyer and Engineer on a weekly basis. A brief weekly e-mail and conference call shall be held between Seller, Buyer, and Engineer to discuss summarized results and proposed plan for the following week. See Part 5 for specific requirements.

2. Seller shall prepare a Final Pilot Summary Report at the completion of the *Pilot Performance Testing Program*. The report shall include, but not be limited to, an introduction of the existing treatment and pilot study; description of operation; presentation and discussion of results; conclusions and recommendations drawn from the study; and associated test data, tables, and graphs. Refer to Part 5 for specific information to be included.

G. Pilot Unit Operation and Maintenance

1. Seller shall provide and be responsible for the cost of an operator for daily operation and maintenance of the pilot system.

2. Seller shall set up any workspace or remote communication needed for pilot plant operator.

3. Seller shall be responsible for cost of labor and other expenses associated with purchase and installation of any replacement parts and any other maintenance associated with the pilot system.

4. Seller shall provide spare parts for typical pilot maintenance issues (e.g., flow meter fouling, faulty turbidimeters, etc.). These spare parts shall be shipped with the pilot system and remain on-site during pilot duration.

5. Buyer and/or Engineer will not be held monetarily liable for any circumstances related to pilot maintenance issues that result in the 90-Day Pilot Study time frame being exceeded (see Article 2.4). If necessary, the Buyer can do a visual check daily to look for problems. The Buyer will not operate or maintain the equipment.

H. Safety

1. Seller shall arrange for proper safety equipment to be onsite for duration of pilot study.

**PART 4 -- PILOT WORK PLAN**

The items listed below (at a minimum) need to be included in the *Pilot Work Plan.*

4.01 DESCRIPTION OF PILOT SYSTEM EQUIPMENT

A. The *Pilot Work Plan* shall include a description of all equipment (pretreatment, MF/UF System, and all ancillary equipment including pumps, tanks, neutralization, etc.) to be used during pilot. Description shall include manufacturer names, operating procedures, operating flows and limitations, volumes, etc. A flow schematic description and P&ID of the pilot system shall be included.

4.02 DETAILED SCHEDULE OF ACTIVITIES

A. Schedule shall include operational plans for all pilot Phases. The schedule shall include proposed plan and associated durations for optimization of fluxes and backwash durations for the MF/UF System. It shall also include anticipated cleaning schedules for MF/UF Systems and membrane integrity tests.

4.03 CHEMICAL DOSAGE REQUIREMENTS

A. All chemical concentration and dosage requirements (including coagulant, etc.) shall be included in the *Pilot Work Plan*. Material Safety Data Sheets for all chemicals to be used during the pilot study shall be included as well.

4.04 OPERATING DATA REQUIREMENTS

A. Seller shall include a daily log sheet in the *Pilot Work Plan* that incorporates minimum operating *data* requirements listed in Table 2. This sheet will be used by the pilot operator. Records of these daily log sheets will be used to compare to applicable on-line recorded operational data.

4.05 WATER QUALITY DATA REQUIREMENTS

A. Seller shall provide an analytical sampling schedule in the *Pilot Work Plan*. Water quality *requirements* and test frequency needed to achieve the *Pilot Performance Testing Program* objectives are indicated in Table 3. All official samples to be used for USEPA monitoring and reporting purposes shall be submitted to an outside approved lab for testing. Supplemental spectrophotometer and other testing should be conducted as needed in addition to the samples listed.

**Table 2 – Minimum Operating Data Requirements**

| **Parameter** | **MF/UF System** |
|---|---|
| Feed Flow Rate (gpm) | Continuous |
| Filtrate / Permeate Flow Rate (gpm) | Continuous |
| Waste / Concentrate Flow Rate (gpd) | Continuous |
| Transmembrane Pressure (TMP) (psi) | Continuous |
| Feed Temperature ($^{O}$C) | Continuous |
| Permeability (specific flux) Calculation[2] | Continuous |

| | |
|---|---|
| Overall Flux | Continuous |
| Overall Recovery | 1 Times per Day |
| Backwash Frequency | Each Backwash Occurrence |
| Backwash Flow Rate (gpm), Total Flow (gal), and | Each Backwash Occurrence |
| Backwash Flush Flow (gpm) | Each Backwash Occurrence |
| Backwash Air Flow (gpm) | 1 Time per Day, 5 Days per |
| Backwash Chemical Requirements | Each Backwash Occurrence |
| Process Air Flow[1] (cfm) | 1 Time per Day, 5 Days per |
| Markers for maintenance cleans | Each clean |
| Markers for recovery cleans | Each clean |

[1] Excluding air used for pneumatic valves and integrity tests.

[2] Calculated value

**Table 3 - Water Quality Parameter Monitoring Frequency performed by Buyer**

| Parameter | Raw Feed Water | MF/UF System | |
|---|---|---|---|
| | | Filtrate | Backwash Waste |
| pH | Continuous | Continuous | Every 2 Weeks |
| Turbidity (NTU) | Continuous | Continuous | Every 2 Weeks |
| Color | Weekly | Weekly | NA |
| Temperature (°C) | NA | Continuous | NA |
| TOC (mg/L) | Weekly | Weekly | Every 2 Weeks |
| DOC (mg/L) | Weekly | Weekly | Every 2 Weeks |
| $UV_{254}$ ($cm^{-1}$) | Weekly | Weekly | Every 2 Weeks |
| Manganese (mg/L) | Weekly | Weekly | NA |
| Iron (mg/L) | Weekly | Weekly | NA |
| Ammonia (mg/L) | Weekly | Weekly | NA |
| Total Alkalinity (mg/L as CaCO3) | Weekly | Weekly | NA |
| Total Hardness (mg/L as CaCO3) | Monthly | NA | NA |
| Aluminum (mg/L) | NA | Weekly | NA |
| Silica (mg/L as SiO2) | Weekly | NA | NA |
| SDS[1] | NA | Weekly | NA |

[1] SDS: THM/HAA5 samples - 5-days, 1,0 mg/l residual, pH8.0

4.06 CLEANING PROCESS REQUIREMENTS

A. The following detailed cleaning process requirements shall be included in the *Pilot Work Plan*.

B. Chemical cleaning procedures including frequency, chemical dosing, flows, duration, and soak times.

C. Cleaning trigger criteria including maximum TMP and time.

D. Submit membrane integrity test procedure.

## PART 5 -- PERFORMANCE EVALUATION

5.01 PARAMETERS FOR EVALUATION OF PERFORMANCE

A. To fulfill the objectives of the *Pilot Performance Testing Program* (Article 2.1) the data collected in Phase 3 testing, will be compiled. All items listed in this part shall be determined during the *Pilot Performance Testing Program* and summarized in the final report.

B. Weekly Pilot Evaluation

1. The Seller shall assemble, interpret, and summarize results of all pilot operational and analytical data and provide to Buyer and Engineer on a weekly basis through an email with attachments and a virtual meeting. Data shall be provided in PDF and Microsoft Excel format each week. System process changes (chemical dosage changes, flux or flow changes, etc.) shall be summarized in e-mail or Microsoft Word format. A brief weekly e-mail and/or conference call shall be held between Seller, Buyer, and Engineer to discuss summarized results and proposed plan for the following week.

5.02 WATER QUALITY

A. All analytical data collected during the pilot study (including all samples as indicated in the *Pilot Work Plan* and those required for the temporary discharge authorization permit) shall be compiled and presented in the Final Pilot Summary Report by the Seller. Data shall be assembled in Microsoft Excel format and shall be attached as an Appendix to the report and provided electronically. Graphs for iron, manganese, hardness, and turbidity (at a minimum) shall be included in the report as well. Explanations shall be provided for all data that does not meet applicable water quality requirements presented in Table 1.

5.03 OPERATIONAL DESIGN PARAMETERS

A. All operational data collected during the pilot study shall be compiled and presented in the Final Pilot Summary Report. Data shall be assembled in Microsoft Excel format and shall be attached as an Appendix to the report and provided electronically in PDF format. Optimum design parameters listed below shall also be included in the final report. An explanation as to how the parameters were optimized shall be included in the report.

B. Optimum Chemical Concentrations and Dosages

1. The following optimum chemical concentrations and dosages shall be included in the Final Pilot Summary Report:

2. Coagulant

3. MF/UF System Cleaning Chemicals

4. All Waste Stream Neutralizing Chemicals.

C. Optimum Parameters

1. The following optimum parameters shall be included in the Final Pilot Summary Report:

2. Average and Maximum TMP for MF/UF Systems

3. Optimum and Maximum Recommended Recoveries for MF/UF Systems

4. Optimum and Maximum Recommended Fluxes for MF/UF Systems.

D. Recommended Operating Conditions

1. Based on the results of the pilot test, the Seller shall provide the recommended operating conditions/parameters for the full-scale treatment system in the Final Pilot Summary Report. These parameters shall include, but not limited to:

a. Pretreatment System

b. Coagulant Dosage and reaction time

c. MF/UF Membrane Treatment Unit

d. Flux and recovery

e. Maximum Acceptable TMP

f. Backwash Interval/Duration/Conditions

g. Maintenance Clean Interval/Duration/Conditions

h. Clean in Place Interval/Duration/Conditions.

5.04 REPRESENTATIVE WASTE STREAM COMPOSITIONS

A. Representative compositions for all pilot system waste streams shall be determined and summarized in the Final Pilot Summary Report.

5.05 CLEANING REGIMES

A. MF/UF System backwashing procedures and CIP procedures for the MF/UF System shall be established during Phases II through IV of the *Pilot Performance Testing Program*. These procedures are to be summarized in the Final Pilot Summary Report and shall contain the following specifics at a minimum:

1. Chemical Information (Concentration and Dosage)

2. pH, Temperature, and Flow Requirements

3. Frequency and Duration

4. Initiation Requirements (TMP Limit, Time, Other)

5. Ancillary Equipment Requirements.

5.06 POTENTIAL CAUSES FOR SYSTEM DEVIATION

A. Any potential causes specific to the site that could cause the overall system to deviate from optimum performance (e.g., membrane fouling) shall be listed in the Final Pilot Summary Report.

5.07 TERMINATION CRITERIA

A. Parameters for operation have been determined in the proposal. The system will be operated until primary termination criteria have been met. Primary termination criteria for the pilot study are as follows:

1. Terminal transmembrane pressure

2. Successful operation of the pilot system for 30 days at the specified conditions

B. Additional criteria may be used to terminate a run, including:

1. Exceeding maintenance clean (MC) time (60 minutes/day) or frequency >48 hour limit.

2. Failure to meet water recovery criteria (95% minimum).

3. If there is a shutdown due to a control logic intervention of the unit, the Buyer has the right to terminate the filter run and require a restart. The total acceptable downtime not requiring a restart due to a control logic intervention of the units is 10% (3 days) per run.

4. Exceeding membrane integrity criteria may disqualify a Seller from the project. If more than one repair occurrence is required to maintain the integrity of a membrane, the Buyer reserves the right to exclude that Seller from the project.

**PART 6 -- QUALITY ASSURANCE/QUALITY CONTROL**

Quality assurance and quality control of the operation of the membrane equipment and the measured water quality parameters will be maintained during the *Pilot Performance Testing Program*.

When specific items of equipment or instruments are used, the objective is to maintain the operation of the equipment or instructions within the ranges specified by the Manufacturer or by standard methods. Maintenance of strict QA/QC procedures is important, in that if a question arises when analyzing or interpreting data collected for a given experiment, it will be possible to verify exact conditions at the time of testing.

Equipment flow rates and associated signals should be documented and recorded on a routine basis. A routine daily walk-through during testing will be established to verify that each piece of equipment or instrumentation is operating properly. Particular care will be taken to confirm that any chemicals are being fed at the defined flow rate into a flow stream that is operating at the expected flow rate, such that the chemical concentrations are correct. In-line monitoring equipment such as flowmeters, etc. will be checked to confirm that the read-out matches with the actual measurement and that the signal being recorded is correct.

The items listed are in addition to any specified checks outlined in the analytical methods.

6.01 QA/QC VERIFICATIONS PERFORMED EVERY WEEK:

A. Chemical feed pump flow rates (verified volumetrically over a specific time period).

6.02 QA/QC VERIFICATIONS PERFORMED EVERY TWO WEEKS:

A. In-line flowmeters/rotameters (clean equipment to remove any debris or biological buildup and verify flow volumetrically to avoid erroneous readings).

B. Online Turbidimeters

6.03 QA/QC VERIFICATIONS PERFORMED EACH MONTH:

A. Differential pressure transmitters (verify gauge readings and electrical signal using a pressure gauge).

6.04 PH

A. A 2-point calibration of the pH meter used in this study will be performed once per day when the instrument is in use. Certified pH buffers in the expected range will be used. The pH probe will be stored in the appropriate solution defined in the instrument manual. Transport of carbon dioxide across the air-water interface can confound pH measurement in poorly buffered waters. If this is a problem, measurement of pH in a confined vessel is recommended to minimize the effects of carbon dioxide loss to the atmosphere.

6.05 TEMPERATURE

A. Raw water temperatures will be obtained at least once daily. The thermometer will have a scale marked for every 0.1 °C, as a minimum, and should be calibrated weekly against a precision thermometer certified by the National Institute of Standards and Technology (NIST). (A thermometer having a range of -1°C to +51°C, subdivided in 0.1 °C increments, will be appropriate for this work.)

6.06 MANGANESE AND IRON

A. Hach spectrophotometer low range methods are acceptable.

6.07 TURBIDITY

A. Bench top Hach model with weekly calibration.

6.08 SAMPLE HANDLING

A. The QA/QC procedures of external labs, which are receiving samples as part of this study, should be previously verified and validated by the Buyer. All water quality samples will be shipped in coolers containing appropriate ice packs to maintain sample temperatures of 4°C or less. All sample coolers will contain a Chain of Custody form signed by the sampler, which identifies the sample contained in the cooler, the analyses to be performed, the collection time, and date of shipment. All data generated during the study will be verified, validated, checked for precision, completeness and representativeness, and also for comparability to what is known and documented.

END OF SECTION

Submitted to: City of Sandy, Oregon

Project: City of Sandy, OR
Alder Creek Water Treatment Plant Upgrade
Membrane Equipment Procurement

## POWER OF ATTORNEY

I, the undersigned Frédéric Dugré, CEO of $H_2O$ Innovation USA, Inc., a corporation organized and existing under the laws of Delaware, hereby declare and certify that **Denis Guibert, Vice President - Water Technologies & Services** and/or **Fraser Kent, Vice President – Technology Sales** is/are duly authorized to make, sign, amend and execute any and all documents on behalf of $H_2O$ Innovation USA, Inc. in relation to the Project described above, including, without limitation, proposal, bonds, contract and/or any other ancillary documents, the whole pursuant to $H_2O$ Innovation USA, Inc.'s Delegation of Authority Policy.

Signed this 29th day of February 2024.

Frédéric Dugré
CEO
$H_2O$ Innovation USA, Inc.
251 Little Falls Drive Wilmington
Delaware 19808, USA

Corporate seal attested by Edith Allain, Secretary.

# STAFF REPORT

| | |
|---|---|
| **Meeting Type:** | City Council Meeting |
| **Meeting Date:** | August 5, 2024 |
| **From:** | Interim Police Chief Kim Yamashita |
| **Subject:** | Resolution 2024-20: 2024 Emergency Operations Plan Update |

**DECISION TO BE MADE:**

Whether to adopt Resolution 2024-20, adopting the 2024 update to the City of Sandy Emergency Operations Plan.

**PURPOSE / OBJECTIVE:**

This Emergency Operations Plan is an all-hazard plan that describes how the City of Sandy will organize and respond to emergencies and disasters in our community, the size or complexity of which is beyond that normally handled by routine operations. Every Emergency Operations Plan should be reviewed, updated, and approved / promulgated by the governing body of the City. Reviews and updates consist of changes or additions in responsibilities, factoring in changes to our community and new or worsening hazards**.**

**BACKGROUND / CONTEXT:**

Sandy's Emergency Operations Plan was originally prepared under a grant from the Office of Grants and Training, United Stated Department of Homeland Security. The plan was originally promulgated by the City Council in 2012.

The best practice is to update emergency plans, minimally, every five years or when there are substantive changes. Staff conducted work to update Sandy's plan in 2021 and early 2022. The updated plan was presented to the Council for adoption in August 2022. During the meeting, the Council raised several questions and while subsequent improvements to the plan were made, the new plan was not represented to the Council for some time.

On July 15, 2024, a further updated version of the plan was reviewed at a City Council work session. Discussion and Q&A on the operations and roles and responsibilities was conducted. There were suggestions for phone trees, including the US Forest Service and better defining requirements of the Council. These suggested edits were made to the document.

Staff believes it is important to formally put this improved and updated plan in place at this time; it is important to note that further refinements to the plan can still be made when the substantive changed need to be made, or at the five-year anniversary of the adoption of this version of the EOP.

**KEY CONSIDERATIONS / ANALYSIS:**

This plan advises the City Emergency Management Team and Elected Officials on the steps of mitigation, preparedness, response, and recovery to emergency situations and represents best practices.

The plan is compatible with Federal, State and other applicable laws, regulations, plans and policies, including the National Response Framework, State of Oregon Emergency Management Plan and the Clackamas County Emergency Operations Plan. In 2005 the City formally adopted the National Incident Management System, including the Incident Command System, and the National Response Framework.

Plan Revisions / Updates

Staff performed a variety of revisions to this latest version of the plan, some of which include updating the hazards and emergencies that have taken place since the last update, broadening the scope of responsibilities assigned to Public Works especially concerning drinking water, and clarifying the role of Development Services during flood events.

Next Steps

The Police Department, in conjunction with other departments, is also updating Sandy's Continuity of Operations Plan (COOP), which is an administrative policy document that supplements the EOP and details the processes for accomplishing administrative and operational functions during emergencies that may disrupt normal business activities.

The City Manager continues to emphasize the importance of staff training in FEMA’s Incident Command System (ICS), to ensure that staff members are prepared to execute their responsibilities in the event they are called upon in an emergency or disaster. Opportunities are also actively being explored to secure funding for dedicated emergency management staff capacity, which will become increasingly important as the community continues to grow.

Lastly, staff believes the Council may wish to review in the near future Ordinance 1-89, written in 1989 and outlining emergency management for the City, to ensure it still reflects the Council’s preferred management approach.

**BUDGET IMPACT:**

No budgetary impact.

**RECOMMENDATION:**

Staff recommends Council approval of the 2024 update to the City of Sandy Emergency Operations Plan as provided in the meeting packet.

**SUGGESTED MOTION LANGUAGE:**

Recommend the council approve the 2024-2026 Emergency Operations plan as presented.

**LIST OF ATTACHMENTS / EXHIBITS:**

- Resolution 2024-20
    - 2024 Emergency Operations Plan

**RESOLUTION NO. 2024-20**

**A RESOLUTION ADOPTING THE 2024 UPDATE TO THE CITY OF SANDY EMERGENCY OPERATIONS PLAN**

**WHEREAS**, the City of Sandy recognizes that planning and preparing for emergencies in advance can reduce potential harm to people and property within our community from natural or human-caused events such as earthquake, fire, flood, terrorism, or other hazards; and

**WHEREAS**, the City of Sandy recognizes the importance of a unified and consistent system to prepare for, respond to, and recover from disasters and emergencies; and

**WHEREAS**, Sandy's Emergency Operations Plan (EOP) provides the framework for emergency response and emergency management in the City of Sandy during disasters and emergencies; and

**WHEREAS**, Sandy's first EOP was promulgated in 2012, and EOPs should be updated on a regular basis to address new hazards and threats, incorporate best practices, and ensure ongoing compatibility with Federal, State and other applicable laws, regulations, plans and policies.

**NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SANDY:**

**Section 1:** The 2024 update to the City of Sandy Emergency Operations Plan, included herein as Exhibit A, is hereby adopted.

This resolution is adopted by the City Council of the City of Sandy this 5th day of August, 2024.

_____

Stan Pulliam, Mayor

ATTEST:

_____

Jeffrey Aprati, City Recorder

# EXHIBIT A

## City of Sandy

WHERE INNOVATION MEETS ELEVATION
SANDY
OREGON

## Clackamas County, Oregon

## EMERGENCY OPERATIONS PLAN

**August 2024 through September 2026**

**Prepared for:**

City of Sandy
39250 Pioneer Blvd
Sandy, OR 97055

The original document from 2012 was prepared under a grant from the Office of Grants and Training, United States Department of Homeland Security. Points of view or opinions expressed in this document are those of the authors and do not necessarily represent the official position or policies of the Office of Grants and Training or the U.S. Department of Homeland Security.

# Preface

This Emergency Operations Plan is an all-hazard plan that describes how the City of Sandy will organize and respond to emergencies and disasters in the community. It is based on, and is compatible with, Federal, State of Oregon, and other applicable laws, regulations, plans, and policies, including the National Response Framework, State of Oregon Emergency Management Plan and the Clackamas County Emergency Operations Plan.

Response to emergency or disaster conditions in order to maximize public safety and minimize property damage is a primary responsibilityof government. It is the goal of the City of Sandy that responses to such conditions are conducted in the most organized, efficient, and effective manner possible. To aid in accomplishing this goal, the City of Sandy has formally adopted the principles of the National Incident Management System (Resolution No. 05-15), including the Incident Command System, and the National Response Framework.

Consisting of a Basic Plan, Functional Annexes that complement the 15 Federal, State, and County Emergency Support Functions, and Incident Annexes, this Emergency Operations Plan provides a framework for coordinated response and recovery activities during a large-scale emergency. The plan describes how various agencies and organizations in the City of Sandy will coordinate resources and activities with other Federal, State, local, Tribal, faith-based, civic, humanitarian, and private-sector partners.

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# Letter of Promulgation

To all Recipients:

Promulgated herewith is the revised Emergency Operations Plan for the City of Sandy. This plan supersedes any previous plans. It provides a framework within which the City of Sandy can plan and perform its respective emergency functions during a disaster or national emergency.

This Emergency Operations Plan attempts to be all-inclusive in combining the four phases of Emergency Management, which are (1) mitigation: activities that eliminate or reduce the probability of disaster and its effects; (2) preparedness: activities that governments, organizations, and individuals develop to save lives, minimize damage, and speed recovery; (3) response: activities that prevent loss of lives and property and provide emergency assistance; and (4) recovery: short- and long-term activities that return all systems to normal or improved standards.

This plan has been approved by the City Council. It will be revised and updated as required. All recipients are requested to advise the City Manager of any changes that might result in its improvement or increase its usefulness. Plan changes will be transmitted to all addressees on the distribution list.

| | |
|---|---|
| Stan Pulliam, Mayor | Laurie Smallwood, Council President |
| Chris Mayton, Council Member | Richard Sheldon, Council Member |
| Carl Exner, Council Member | Don Hokanson, Council Member |
| Kathleen Walker, Council Member | DATE |

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# Plan Administration

The City of Sandy City Manager will administer review, revision, and re-promulgation of this plan every five years or whenever changes occur, such as lessons learned from exercises or actual events. Changes to the annexes and appendices, and non-substantive changes to the Basic Plan, may be made without formal City Council approval.

## Record of Plan Changes

All updates and revisions to this plan will be tracked and recorded in the following table. This process will ensure that the most recent version of the plan is disseminated and implemented by emergency response personnel.

| Date | Change No. | Purpose of Update |
|---|---|---|
| 2012 | Original Release | Update information and bring overall information and formatting in line with Emergency Operations Plans (EOP's) throughout the State of Oregon |
| 2024 | 1 | Update EOP information that has changed within the City, County and State. Promulgation |
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## Plan Distribution List

Copies of this plan will be provided for other jurisdictions, agencies, and interested persons electronically, unless otherwise indicated. Updates will be provided electronically, when available. Recipients will be responsible for updating their respective EmergencyOperations Plans when change notifications are received. The Emergency Manager is ultimately responsible for dissemination of all plan updates.

| Date | No. of Copies | Jurisdiction/Agency/Person |
|---|---|---|
| | 1 | City Administration |
| | 1 | City Finance Department |
| | 1 | Clackamas Fire District |
| | 1 | City Library |
| | 1 | City Manager's Office |
| | 1 | City Planning and Development Department |
| | 1 | City Police Department |
| | 1 | City Public Works Department |
| | 1 | City Transit |
| | 1 each | Mayor and City Council |
| | 1 | Clackamas Fire District #1 |
| | 1 | Clackamas County Sheriff's Office |
| | 1 | Clackamas County Emergency Management |
| | 1 | Oregon Trail School District |
| | 1 | Oregon Emergency Management |
| | | |
| | | |
| | | |

### Emergency Operations Plan Review Assignments

Unless otherwise stated, the following table identifies agencies responsible for reviewing specific plan sections and annexes. Changes will be forwarded to the City Manager for revision and dissemination of the plan. This does not preclude other departments and agencies with a vital interest in the annex from providing input to the document; such input is, in fact, encouraged.

| Section/Annex | Responsible Party |
|---|---|
| **Basic Plan** | City Manager |
| **Functional Annexes (FAs)** | |
| **FA 1** Emergency Services | City Manager |
| **FA 2** Human Services | City Manager |
| **FA 3** Infrastructure Services | Public Works Director |
| **FA 4** Recovery Strategy | City Manager |
| **Incident Annexes (IAs)** | |
| **IA 1** Earthquake/Seismic Activity | Public Works Director<br>Building Official |
| **IA 2** Severe Weather (including Landslides) | Public Works Director |
| **IA 3** Hazardous Materials (Accidental Release) | Clackamas Fire District |
| **IA 4** Flood (including Dam Failure) | Public Works Director<br>Development Services Director |
| **IA 5** Major Fire | Clackamas Fire District<br>US Forest Service |
| **IA 6** Transportation Accidents | Police Chief |
| **IA 7** Terrorism | Police Chief |
| **IA 8** Volcano/Volcanic Activity | Public Works Director |

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# Table of Contents

**Table of Contents**

**Functional Annexes**

1 FA 1 – Emergency Services
2 FA 2 – Human Services
3 FA 3 – Infrastructure Services
4 FA 4 – Recovery Strategy

**Support Annexes**

1 SA A – Emergency Operations Plan Summary

**Incident Annexes**

1 IA 1 – Earthquakes/Seismic Activity
2 IA 2 – Severe Weather (including Landslides)
3 IA 3 – Hazardous Materials (Accidental Release)
4 IA 4 – Flood (including Dam Failure)
5 IA 5 – Major Fire
6 IA 6 – Transportation Accidents
7 IA 7 – Terrorism
8 IA 8 – Volcano/Volcanic Activity

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# List of Tables and Figures

## Figures



## Tables

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# 1 Introduction

## 1.1 General

This Emergency Operations Plan (EOP) establishes guidance for the City of Sandy (City) actions during response to, and short-term recovery from, major emergencies or disasters. It promulgates a framework within which the City will combine technical capabilities and resources, plus the sense, judgment, and expertise of its emergency response personnel, department directors, and other decision makers. Specifically, this EOP describes the roles and responsibilities ofthe City departments and personnel when an incident occurs, and it establishes a strategy and operating guidelines that support implementation of the National Incident Management System (NIMS), including adherence to the concepts and principles of the Incident Command System (ICS).

The City views emergency management planning as a continuous process that is linked closely with training and exercises to establish a comprehensive preparedness agenda and culture. This EOP will be maintained through a program of continuous improvement, including ongoing involvement of City departments and of agencies and individuals with responsibilities and interests in the plan.

## 1.2 Purpose and Scope

### 1.2.1 Purpose

The City EOP provides a framework for coordinated response and recovery activities during an emergency. This plan is primarily applicable to extraordinarysituations and is not intended for use in response to typical, day-to-day emergencysituations. This EOP complements the Clackamas County (County) EOP, the State of Oregon (State) Emergency Management Plan (EMP), and the National Response Framework (NRF). It also identifies critical tasks needed to support a wide range of response activities.

This plan is not intended for day-to-day emergency responses in the City, but rather expands on the day-to-day emergency management concepts. The efforts that would be required for normal functions will be redirected to disaster incident tasks. The incident management process is intended to create a unified incident command that provides input into the decision-making process but assigns actual decision making to an agreed upon individual. Decisions will be delegated as far down the chain of hierarchy as possible to allow personnel to exercise discretionary authority in problem solving.

### 1.2.2 Scope

The City EOP is intended to be invoked whenever the City must respond to an unforeseen incident or planned event, the size or complexity of which is beyondthat normally handled by routine operations. Such occurrences may include natural or human-caused disasters and may impact the City itself, neighboring cities, unincorporated areas of the County, or a combination thereof.

Notwithstanding its reach, this plan is intended to guide only the City's emergency operations, complementing, and supporting implementation of the emergency response plans of the various local governments, special districts, and other public- and private-sector entities within and around the City but not supplanting or taking precedence over them.

The primary users of this plan are elected officials, department heads and their senior staff members, emergency management staff, and others who may participate in emergency response and recovery efforts. The general public is also welcomed to review non-sensitive parts of this plan to better understand the processes by which the City manages the wide range of risks to which it is subject.

## 1.3 Plan Activation

Once promulgated by the City Council, the EOP is in effect and may be implemented in whole or in part to respond to:

- Incidents in or affecting the City.
- Health emergencies in or affecting the City.
- Life-safety issues City-wide.

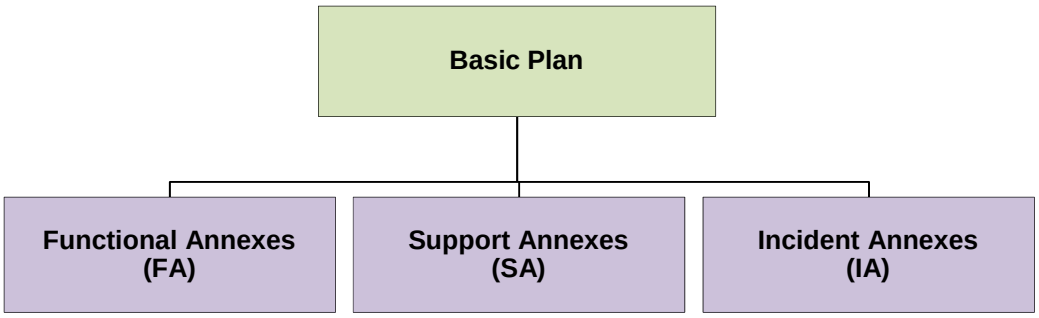
An Emergency Declaration is not required to implement the EOP or activate the Emergency Operations Center (EOC). The City Manager may implement the EOP as deemed appropriate for the situation or at the request of an Incident Commander (IC).

## 1.4 Plan Organization

The City EOP is composed of four main elements:

- Basic Plan (with Appendices).
- Functional Annexes (FAs).
- Support Annexes (SAs).
- Incident Annexes (IAs).

**Figure 1-1 City of Sandy EOP Plan Organization**




### 1.4.1 Basic Plan

The purpose of the Basic Plan is to:

- Provide a description of the legal authorities upon which the City hasstructured its emergency management organization (EMO), includingthe emergency declaration process, activation of mutual aid agreements, and request for resources and emergency spending powers.
- Describe the context under which the City's employees will respond to an incident, including a community profile and discussion of hazards and threats facing the community.
- Assign and describe roles and responsibilities for the City's agenciestasked with emergency mitigation, preparedness, response, and recovery functions.
- Describe a concept of operations for the City that provides a framework upon which the City will conduct its emergency operationsand coordinate with other agencies and jurisdictions.
- Describe the City's emergency response structure, including activationand operation of the City Emergency Operations Center (EOC) and implementation of ICS.
- Discuss the City's protocols for maintaining and reviewing this EOP,including training, exercises, and public education components

### 1.4.2 Functional Annexes

The Basic Plan is supplemented by FAs, SAs, and IAs. The FAs focus on critical tasks, capabilities, and resources provided by emergency response agencies for the City throughout all phases of an emergency. In the event of an incident for which the City's capabilities and/or resources are limited or exhausted, each annex clearly defines escalation pathways, and resource request procedures for seeking additional support from County agencies are clearly defined in each annex.

For the purposes of this EOP, information regarding common management functions performed by the City and supporting agencies and organizations are streamlined into four FAs:

- FA 1 – Emergency Services
- FA 2 – Human Services
- FA 3 – Infrastructure Services
- FA 4 – Recovery Strategy.

The fourth functional annex, Recovery Strategy, identifies the City's roles and responsibilities for ensuring the short-term protection of the community's life, health, and safety and for supporting response missions such as fire suppression. Additionally, it helps to guide the community's long-term efforts to regain normal functions, such as commerce and employment, public transportation, and the use of structures such as buildings, bridges, and roadways.

During a major emergency or disaster affecting the County or a portion thereof, City departments and special districts may be asked to support the larger response. Request for such assistance would come from County Emergency Management. Table 1-5 outlines the ESFs each agency/organization may be requested to support.

If the County EOP is implemented during an incident or Countywide emergency declaration, the City will adopt command and control structures and procedures representative of the County's response operations in accordance with the requirements of NIMS and ICS, as necessary.

**Table 1-4 City Coordination with County ESFs**

| Key: P – Primary S – Support | 1 – Transportation (including Transit) | 2 – Communications | 3 – Public Works and Engineering | 4 – Firefighting | 5 – Emergency Management | 6 – Mass Care, Emergency Assistance, Housing, and Human Services | 7 – Logistics Management and Resource Support | 8 – Public Health and Medical Services | 9 – Search and Rescue | 10 – Oil and Hazardous Materials | 11 – Agriculture and Natural Resources | 12 – Energy | 13 – Public Safety and Security | 14 – Long-Term Community Recovery | 15 – External Affairs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **City of Sandy** | | | | | | | | | | | | | | | |
| City Administration | | S | | | S | S | S | S | | | S | | | **P** | **P** |
| Mayor/City Council | | | | | S | | | | | | | | | S | |
| Finance Department | | | | | S | | **P** | | | | | | | S | |
| Human Resources Department | | | | | S | | S | | | | | | | | |
| Sandy Net | | S | | | S | | S | | | | | | S | S | |
| Library | | | | | S | | S | | | | | | | | |
| Development Services Department | | | | | S | S | S | S | | | | | | S | |
| Transit Department | **P** | S | | | S | | | | | | | | | S | |
| Planning Development Department | | | S | | S | | S | | | | | | | S | |
| Police Department | S | S | | | **P** | | S | | **P** | S | | | **P** | S | |
| Public Works Department | **P** | S | **P** | S | S | | S | | | S | **P** | **P** | S | S | |
| **Clackamas County** | | | | | | | | | | | | | | | |
| CCOM | | **P** | | | | | | | | | | | | | |
| Sheriff's Office | | S | | | | | S | | S | S | | | S | S | |
| ODOT | S | | | | | | | | | | | | | | |
| Public Works | **P** | S | S | | | | S | | | S | | S | S | S | |
| Health, Housing and Human Services | | | | | | S | S | **P** | | | **P** | | | | |
| Emergency Management | | | | | S | S | S | | | | S | S | | S | S |
| **Special Districts** | | | | | | | | | | | | | | | |
| Clackamas Fire District No. 72 | S | S | | **P** | **P** | S | S | S | **P** | **P** | | | S | S | |
| Oregon Trail School District | | S | | | | S | S | S | | | | | | S | S |
| Clackamas Fire District | S | S | | **P** | **P** | S | S | S | **P** | **P** | | | S | | |

**Table 1-4 (continued) City Coordination with County ESFs**

| Key:<br>P – Primary<br>S – Support | 1 – Transportation (including Transit) | 2 – Communications | 3 – Public Works and Engineering | 4 – Firefighting | 5 – Emergency Management | 6 – Mass Care, Emergency Assistance, Housing, and Human Services | 7 – Logistics Management and Resource Support | 8 – Public Health and Medical Services | 9 – Search and Rescue | 10 – Oil and Hazardous Materials | 11 – Agriculture and Natural Resources | 12 – Energy | 13 – Public Safety and Security | 14 – Long-Term Community Recovery | 15 – External Affairs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Private/Non-Profit Organizations** | | | | | | | | | | | | | | | |
| NW Natural Gas | | | | | | | | | | | | P | | | |
| Phone companies | | S | | | | | | | | | | | | | |
| HazMat Region 3 | | | | | | | | | | P | | | | | |
| City -WQMD 554 – 1660 AM | | S | | | | | | | | | | | | | S |
| Sandy Action Center | | | | | | S | S | | | | | | | | |
| Corbett NERT/CERT | | S | | S | S | S | S | S | S | | | | S | | S |
| ARES/RACES (Ham Radio) | | S | | | | | | | | | | | | | |
| Medical Clinics (Legacy) | | | | | | S | | S | | | | | | | |
| Electricity (Portland General Electric) | | | | | | | | | | | | P | | | |
| Garbage (Hood View Disposal) | | | | | | | S | | | | | | | | |
| Student Transportation of America (STA) | S | | | | | | S | | | | | | | | |
| Ambulance Services - AMR | | | | | | S | S | S | | | | | | | S |
| American Red Cross | | | | | | P | S | | | | | | | | S |
| Pamplin Media (Sandy Post) | | S | | | | | | | | | | | | | |
| Chamber of Commerce | | S | | | | | S | | | | | | | S | S |

### 1.4.3 Incident Annexes

Additionally, IAs are included with the Basic Plan to provide tactical information and critical tasks unique to specific natural and human-caused/technological hazards that could pose a threat to the City. Incident types are based on the hazards identified in the most recent Hazard Identification and Vulnerability Assessment conducted for the County.

**Table 1-5 City Incident Annexes (IAs)**

| Annex | Hazard |
|---|---|
| IA 1 | Earthquake/Seismic Activity |
| IA 2 | Severe Weather (including Landslides) |
| IA 3 | Hazardous Materials (Accidental Release) |
| IA 4 | Flood (including Dam Failure) |
| IA 5 | Major Fire |
| IA 6 | Transportation Accidents |
| IA 7 | Terrorism |
| IA 8 | Volcano/Volcanic Activity |

*Note: Resource shortages and civil disobedience are considered secondary risks during any emergency.*

If the County EOP is implemented during a Countywide incident or emergency declaration, the City will adopt command and control structures and procedures representative of the County's response operations, in accordance with the requirements of NIMS and ICS, as necessary.

## 1.5 Relationship to Other Plans

### 1.5.1 Federal Plans

#### 1.5.1.1 National Incident Management System (NIMS)

Homeland Security Presidential Directive 5 directed the Secretary of Homeland Security to develop, submit for review by the Homeland Security Council, and administer a National Incident Management System. NIMS, including ICS, enhances the management of emergency incidents by establishing a single comprehensive system and coordinated command structure to help facilitate a more efficient response among departments and agencies at all levels of government and, if necessary, spanning jurisdictions.

#### 1.5.1.2 National Response Framework

The NRF is a guide to how the State and Federal government should conduct all-hazards response. It is built upon a scalable, flexible, and adaptable coordinationstructure to align key roles and responsibilities across the country. It describes specific authorities and best practices for managing incidents that range from theserious, but purely local, to large-scale terrorist attacks or catastrophic natural disasters.

The NRF organizes the types of response assistance a state is most likely to needinto 15 ESFs. Each ESF has a primary agency assigned for maintaining and coordinating response activities.

#### 1.5.1.3 National Disaster Recovery Framework

The National Disaster Recovery Framework (NDRF) provides guidance to facilitate effective recovery support to disaster-impacted States, Tribes, and local jurisdictions. It provides a flexible structure that enables disaster recovery managers to operate in a unified and collaborative manner. It also focuses on how best to restore, redevelop, and revitalize the health, social, economic, natural, and environmental fabric of a community and build a more resilient nation.

The NDRF defines:

- Core recovery principles.
- Roles and responsibilities of recovery coordinators and other stakeholders.
- A coordinating structure that facilitates communication and collaboration among all stakeholders.
- Guidance for pre- and post-disaster recovery planning.
- The overall process by which communities can capitalize on opportunities to rebuild stronger, smarter, and safer.

### 1.5.2 State Plans

#### 1.5.2.1 State of Oregon Emergency Management Plan

The Oregon EMP is developed, revised, and published by the Director of Oregon Emergency Management (OEM) under the provisions of Oregon Revised Statutes(ORS) 401.270, which are designed to coordinate the activities of all public and private organizations that provide emergency services within the State and to provide for and staff a State Emergency Coordination Center (ECC) to aid the Governor. ORS 401.035 makes the Governor responsible for the emergency services system within the State of Oregon. The Director of OEM advises the Governor and coordinates the State's response to an emergency or disaster.

The Oregon EMP consists of three volumes:

- *Volume I: Preparedness and Mitigation* consists of plans and guidance necessary for State preparation to resist a disaster's effects. Sections include disaster hazard assessment, the Emergency Management Training and Exercise Program, and

plans to mitigate (or lessen) a disaster's physical effects on citizens, the environment, and property.

- *Volume II: Emergency Operations Plan* broadly describes how the State uses organization to respond to emergencies and disasters. It delineates the EMO; contains FAs that describe the management of functional areas common to most major emergencies or disasters, suchas communications, public information, and others; and contains hazard-specific annexes.

- *Volume III: Relief and Recovery* provides State guidance, processes, and rules for assisting Oregonians with recovery from a disaster's effects. It includes procedures for use by government, business, andcitizens.

Activation and implementation of the Oregon EMP (or specific elements of the plan) may occur under various situations. The following criteria would result inactivation of the EMP, including the EOP:

- The Oregon Emergency Response System (OERS) receives an alert from an official warning point or agency, indicating an impending orprobable incident or emergency.
- The Governor issues a "State of Emergency."
- A statewide disaster is imminent or occurring.
- Terrorist activities or weapons of mass destruction incidents are occurring or imminent.
- An alert, site emergency, or general emergency is declared at the Washington Hanford Nuclear Reservation in Washington State or at the research reactors at Oregon State University or Reed College.
- A localized emergency escalates, adversely affecting a larger area or jurisdiction and exceeding local response capabilities.
- A geographically limited disaster requires closely coordinated response by more than one State agency.
- An affected city or county fails to act.

## 1.5.3 County Plans

### 1.5.3.1 Clackamas County Emergency Operations Plan

The County EOP is an all-hazard plan describing how the County will organize and respond to events that occur in individual cities, across the County, and in thesurrounding region. The plan describes how various agencies and organizations in the County will coordinate resources and activities with other Federal, State, local, Tribal, and private-sector partners. Use of NIMS/ICS is a key element in the overall County response structure and operations.

The County EOP Basic Plan describes roles, responsibilities, and concepts of operations, command, and control, while clearly defining escalation pathways and legal authorities involved with critical decision making and resource allocation bylocal and county governments. The 15 ESF annexes supplement the information in the Basic Plan and are consistent with the support functions identified in State and Federal plans. Each ESF serves as an operational-level mechanism for identifying primary and support entities to maintain capabilities for providing resources and services most likely needed throughout all phases of an emergency.In addition, the County EOP contains IAs to provide tactical information and critical tasks unique to specific natural and human-caused/technological hazards that could pose a threat to the County.

If capabilities or resources prove limited or unavailable to the City during an emergency or disaster, escalation pathways and resource request procedures forseeking additional resources through County, State, or Federal agencies are clearly defined in each County ESF.

## 1.5.4 City Plans

### 1.5.4.1 Continuity of Operations and Continuity of Government Plans

The City has formalized a Continuity of Operations (COOP) plan. This plan maybe used in conjunction with the EOP during various emergency situations. COOP and Continuity of Government (COG) plans detail the processes for accomplishing administrative and operational functions during emergencies that may disrupt normal business activities. Parts of these plans identify essential functions of local government, private-sector businesses, and community servicesand delineate procedures to support their continuation. COOP/COG plan elements may include, but are not limited to:

- Identification and prioritization of essential functions.
- Establishment of orders of succession for key positions.
- Establishment of delegations of authority for making policy determination and other decisions.
- Identification of alternate facilities, alternate uses for existingfacilities, and, as appropriate, virtual office options, includingtelework.
- Development of interoperable communications systems.
- Protection of vital records needed to support essential functions.
- Management of human capital.
- Development of a Test, Training, and Exercise Program for continuitysituations.
- Devolution of Control planning.
- Reconstitution and resumption of normal operations.

#### 1.5.4.2 Natural Hazard Mitigation Plan

A Natural Hazards Mitigation Plan (NHMP) was adopted by the City of Sandy on January 4, 2010. The NHMP was developed as an addendum to the Clackamas County NHMP to increase the community's resilience to natural hazards. The addendum focuses on the natural hazards that could affect the City, including floods, landslides, wildfires, severe storms, earthquakes, and volcanoes. A recent update conducted in 2024 was completed to the NHMP has been conducted and includes an increased focus on wildfire.

*See Chapter 2 and the NHMP for a more detailed hazard analysis.*

## 1.6 Authorities

### 1.6.1 Legal Authorities

In the context of this EOP, a disaster or major emergency is characterized as an incident requiring the coordinated response of all government levels to save the lives and protect the property of a large portion of the population. This plan is issued in accordance with, and under the provisions of, ORS Chapter 401, whichestablishes the authority for the highest elected official of the City Council to declare a state of emergency.

The City conducts all emergency management functions in a manner consistentwith NIMS. Procedures supporting NIMS implementation and training for the City are in the process of being developed and formalized by the City.

City Administration has been identified as the lead agency in the EMO. The CityManager, given the collateral title of Emergency Manager, has the authority and responsibility for the organization, administration, and operations of the EMO.

Table 1-6 sets forth the Federal, State, and local legal authorities upon which the organizational and operational concepts of this EOP are based.

**Table 1-6 Legal Authorities**

| Federal |
|---|
| — Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended |
| — National Incident Management System (NIMS) |
| — National Response Framework (NRF) |
| — Homeland Security Presidential Directive 5: Management of Domestic Incidents |
| — Homeland Security Presidential Directive 8: National Preparedness |
| — Executive Order 13347, July 2004, Individuals with Disabilities in Emergency Preparedness |
| — Pet Evacuation and Transportation Standards Act of 2006, Public Law 109-308, 2006 |

| Table 1-6 Legal Authorities (continued) |
|---|
| **State of Oregon** |
| — ORS 401, Emergency Management and Services<br>— ORS 402, Emergency Mutual Assistance Agreements<br>— ORS 403, 9-1-1 Emergency Communications System; 2-1-1 Communications System; Public Safety Communications System<br>— ORS 404, Search and Rescue<br>— ORS 431, State and Local Administration and Enforcement of Health Laws<br>— ORS 433, Disease and Condition Control; Mass Gatherings, Indoor Air<br>— ORS 476, State Fire Marshal; Protection From Fire Generally<br>— ORS 477, Fire Protection of Forests and Vegetation<br>— State of Oregon Emergency Operations Plan (2017) |
| **Clackamas County** |
| — Clackamas County Emergency Operations Plan<br>— Clackamas County Code 6.03, Emergency Regulations.<br>— Board Order #2008-154, September 2008<br>— Resolution 2005-26, February 2005 |
| **City of Sandy** |
| — Resolution to Standardize and Enhance Incident Management Procedures Nationwide, Resolution 2005-06; April 4th, 2005 |

### 1.6.2 Mutual Aid and Intergovernmental Agreements

State law (ORS 401.480 and 401.490) authorizes local governments to enter into Cooperative Assistance Agreements with public and private agencies in accordance with their needs (e.g., the Omnibus Mutual Aid Agreement).

Personnel, supplies, and services may be used by a requesting agency if the granting agency cooperates and extends such services. However, without a mutual aid pact, both parties must be aware that State statutes do not provide umbrella protection except in the case of fire suppression pursuant to ORS 476(the Oregon State Emergency Conflagration Act).

*See Appendix D for existing Mutual Aid Agreements.*

Copies of these documents can be accessed through online document archives. During an emergency, a local declaration may be necessary to activate these agreements and allocate appropriate resources.

## 1.7 Emergency Powers

### 1.7.1 General

Based on local ordinances and state statutes, a local declaration by the City Council allows for flexibility in managing resources under emergency conditions such as:

- Diverting funds and resources to emergency operations to meet immediate needs.
- Authorizing implementation of local emergency plans and implementing extraordinary protective measures.
- Receiving resources from organizations and individuals initiated through mutual aid and cooperative assistance agreement channels.
- Providing specific legal protection for actions initiated under emergency conditions.
- Setting the stage for requesting State and/or Federal assistance to augment local resources and capabilities.
- Raising public awareness and encouraging the community to become involved in protecting their resources.

The City Attorney should review and advise City officials on possible liabilities arising from disaster operations, including the exercising of any or all the above powers. The disaster declaration process follows these three steps:

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| Local Declaration of Emergency | State Declaration of Emergency | Federal Disaster Declaration |

### 1.7.2 City of Sandy Disaster Declaration Process

A declaration of emergency by the City is the first step in accessing State and Federal assistance. Chapter 2.80 of the Sandy Municipal Code establishes the process for declaring and terminating a state of emergency.

OEM has set forth the following criteria necessary in declaring a local emergency:

- Describe the circumstances impacting an identified geographic area.
- Identify the problems for which assistance is needed.
- Clearly state what has been done locally to respond to the impact and what local resources have been expended.

- Request of resources needed, and the type of assistance required

The Command and General Staff have the following responsibilities in the declaration process.

**Operations:** Identify necessary resources and outline special powers needed to respond to the emergency. Assist in initial damage assessment.

**Planning:** Provide situation and resource summaries. Provide initial and preliminary damage assessments.

**Logistics:** Compile resource requests.

**Finance:** Assist in preliminary damage assessment and coordinate damage survey activities

**Command:** Present the declaration package to the Mayor and City Council

The City may choose to declare a local emergency even if the need for additional support or resources is not anticipated to implement provisions of the emergency code. The City's request for a declaration must be processed through Clackamas County Emergency Management to OEM. The request for a disaster declaration and assistance does not indicate the surrender of Command responsibility and authority.

### 1.7.2.1 Emergency Acquisition of Resources

During a declared emergency, the City is authorized to extend government authority to non-governmental resources (e.g. personnel and equipment) that may support regular government forces during an emergency and may enter into agreements with other public and private agencies for use of resources. When real or personal property is taken under power granted by this section, the owner of the property shall be entitled to reasonable compensation.

## 1.7.3 Clackamas County Declaration Process

Clackamas County Code 6.03 restricts the BCC's authority to declare an emergency for the unincorporated areas of the County unless one or more citieshave asked to be included in the declaration. County and city officials must coordinate emergency declarations closely when incidents cross city/county boundaries to ensure inclusion for anticipated needs.

The Clackamas County Board of County Commissioners (BCC) may declare an emergency when:

- It is beneficial to centralize control of county assets under the Chair; authorizing implementation of extraordinary emergency protective measures.
- Providing specific legal protection for actions initiated under emergency

conditions.

- Setting the stage for requesting state and/or federal assistance toaugment local resources and capabilities.

At the earliest practical opportunity, the BCC shall adopt a written declaration of emergency, which shall become part of the County's official records. If circumstances prohibit the timely action of the BCC, the Chair of the BCC may declare a state of emergency and seek approval of a majority of the BCC at the first available opportunity.

### 1.7.4 Federal Declaration Process

The Federal Government may declare an incident either an "emergency" or a "major disaster." When the President of the United States declares either condition to exist, various resources of the federal government are available to respond to the emergency, and disaster funding is made available for recovery. Certain federal agencies have disaster responsibilities which can be activated short of a federal disaster declaration.

The Governor of the State of Oregon, with assistance of Oregon Emergency Management (OEM), will prepare and forward a request for a Presidential declaration of an emergency or a major disaster to FEMA Region 10, who will, in turn, present it to the President.

## 1.8 Continuity of Government

### 1.8.1 Lines of Succession

Table 1-8 provides the policy and operational lines of succession during an emergency for the City.

**Table 1-8 City Lines of Succession**

| Emergency Operations | Emergency Policy and Governance |
|---|---|
| City Manager/Deputy City Manager | Mayor |
| Police Chief | Council President |
| Public Works Director | City Councilors (order of seniority) |

Each City department is responsible for pre-identifying staff patterns showing a line of succession in management's absence. Lines of succession for each department can be found in the City's COOP plan. All employees should be trained on the protocols and contingency plans required to maintain leadership within the department. The City Manager will provide guidance and direction todepartment heads to maintain continuity of government and operations during anemergency. Individual department heads within the City are responsible for developing and implementing COOP/COG plans to ensure continued delivery ofvital services during an emergency.

### 1.8.2 Preservation of Vital Records

Each City department must provide for the protection, accessibility, and recovery of the

agency's vital records, systems, and equipment. These are records, systems, and equipment that if irretrievable, lost, or damaged will materially impair the agency's ability to conduct business or carry out essential functions. In regard, each agency should have a maintenance program for the preservation and quality assurance of data and systems. The program should weigh the cost of protecting or reconstructing records against the necessity of the information to achieving the agency mission.

## 1.9 Administration and Logistics

### 1.9.1 Request, Allocation, and Distribution of Resources

Resource requests and emergency/disaster declarations must be submitted by the City Emergency Manager to County Emergency Management according to provisions outlined under ORS Chapter 401.

The City Emergency Manager (or designee) is responsible for the direction and control of the City's resources during an emergency and for requesting any additional resources required for emergency operations. Once mutual aid optionshave been exhausted, all assistance requests are to be made through County Emergency Management via the County EOC. County Emergency Managementprocesses subsequent assistance requests to the State.

In the case of fires that threaten life and structures, the Conflagration Act (ORS 476.510) can be invoked by the Governor through the Office of State Fire Marshal. This act allows the State Fire Marshal to mobilize and fund fire resources throughout the State during emergency situations. The Clackamas Fire Chief assesses the status of the incident(s) and, after determining thatall criteria have been met for invoking the Conflagration Act, notifies the State Fire Marshal via OERS. The State Fire Marshal reviews the information and notifies the Governor, who authorizes the act.

### 1.9.2 Financial Management

During an emergency, the City is likely to find it necessary to redirect City funds to effectively respond to the incident. The authority to adjust department budgets and funding priorities rests with the City Council. If an incident in the City requires major redirection of City fiscal resources, the City Council will meet in emergency session to decide how to respond to the emergency funding needs, willdeclare a State of Emergency, and will request assistance through the County as necessary.

Expenditure reports are submitted to the Finance Department and managed through the Finance Director to identify budgetary shortfalls. Human Resources will support procurement issues related to personnel, both volunteer and paid. In addition, copies of expense records and all supporting documentationshould be submitted for filing Federal Emergency Management Agency (FEMA) Public Assistance reimbursement requests.

### 1.9.3 Legal Support and Liability Issues

Liability issues and potential concerns among government agencies, private entities, and other response partners and across jurisdictions are addressed in existing mutual aid agreements and other formal memoranda established for theCity and its surrounding

areas.

## 1.9.4 Reporting and Documentation

Proper documentation and reporting during an emergency is critical for the City to receive proper reimbursement for emergency expenditures and to maintain a historical record of the incident. City staff will maintain thorough and accurate documentation throughout the course of an incident or event. Incident documentation should include:

- Incident and damage assessment reports.
- Incident command logs.
- Cost recovery forms.
- Incident critiques and after-action reports

## 1.9.5 Policies

The following policies enable the City to make effective use of available resources in its efforts to minimize the effects of emergencies.

- Essential City services will be maintained for as long as conditions permit.
- An emergency will require prompt and effective response and recovery operations by City departments, disaster relief, volunteer organizations, and the private sector.
- Environmental, technological, and civil emergencies may be of such magnitude and severity that they require County, State, and Federal assistance.
- County and State support of City emergency operations will be based on the principal of self-help. The City will be responsible for utilizing all available local and mutual aid resources prior to requesting assistance from either County Emergency Management or the State of Oregon.
- When an emergency exists, all City departments will put their emergency operations plans and operating guidelines into limited or full operation, as necessary.
- In the event of an emergency, the IC has the authority to re-assign City personnel to assist in response.
- Operational situation and status reports will be made by incident management staffs based upon severity of the emergency or anticipated emergency; reports will include:
    - Estimated time and location of impact.
    - Date, time, and location of the actual emergency.
    - For emergencies with minimum or no warning date, time, location, known or estimated number of injuries or casualties, and estimated damage at time of report.
    - Date and time of activation of department emergency operations.

  Such reports will be forwarded to the Mayor, City Manager, department

directors, EOC and Field Operations Center, and affected jurisdictions as appropriate.

- Access to emergency services shall not be denied on the grounds of race, color, national origin, sex, age, or handicap. The needs of special populations shall be identified and planned for as directed by policy makers and according to federal regulations and guidance. Special populations may include, but are not limited to:
  - Physical or mentally handicapped persons.
  - Non-English speakers.
  - The aged or infirm.
  - The incarcerated.
  - The hospitalized.

The City has the following programs in place for special populations:

- TTD/TTY contact for the hearing-impaired.
- Spanish/English speakers in the Police Department, identified language skills of other City employees.
- Handicapped access to City facilities.
- Identified transportation assistance through Transit Department for the physically handicapped

- Emergency response often requires decisions to be made quickly under adverse conditions. Emergency conditions may require actions that are not listed in this plan or that run counter to guidelines suggested. Government entities complying with this plan shall not be liable for injury, death, or loss of property except in cases of willful misconduct or gross negligence.

## 1.10 Safety of Employees and Family

All department heads (or designees) are responsible for the safety of employees.Employees should attempt to contact their supervisors and managers within the first 24 hours following an incident. Emergency 911 should only be utilized if emergency assistance is needed. Agencies and departments with developed COOP plans will establish alternate facilities and staff locations, as applicable. Notification procedures for employee duty assignments will follow the requiredprocedures established by each agency and department.

During biological incidents or public health emergencies such as pandemics, maintaining a resilient workforce is essential to performing the response activities required to protect the City and surrounding community from significant impacts to human lives and the economy. Thus, personnel should beprovided with tools to protect themselves and their families while they provide health and medical services during a pandemic or other type of public health emergency.

Currently, plans formally addressing the safety and protection of medical personnel and response staff during a biological incident and/or contagious outbreak have not been developed. Safety precautions and personal protective equipment (PPE) decisions will be specific tothe type of incident occurring and will require just-in-time training among the first responder community and other support staff to implement appropriate procedures.

If necessary, the Oregon Occupational Safety and Health Administration (OSHA) may provide assistance and guidance on worker safety and health issues. Information about emergency procedures and critical tasks involved in a biological emergencyincident or disease outbreak is presented in ESF 8 of the County EOP.

While all City agencies and employees are expected to contribute to the emergency response and recovery efforts of the community, employees' first responsibility is to their own and their families' safety. Each employee is encouraged to develop family emergency plans to facilitate family safety and self-sufficiency, which in turn will enable employees to assume their responsibilities to the County and its citizens as rapidly as possible. Processes that support employees and their families during emergency situations or disasters will be further developed through ongoing COOP and COG planning.

# 2 Situation and Planning Assumptions

## 2.1 Situation

The City of Sandy is exposed to many hazards, all of which have the potential to disrupt the community, cause damage, and create casualties. Possible natural hazards include droughts, floods, wildfires, and winter storms. The threat of a war-related incident such as a nuclear, biochemical, or conventional attack is present as well. Other disaster situations could develop from hazardous material accidents, health-related incidents, conflagrations, major transportation accidents, or acts of terrorism.

### 2.1.1 Community Profile

The City of Sandy is a scenic community with beautiful views and vast outdoor recreationalopportunities, and it serves as a gateway for tourists visiting Mount Hood and the Mount Hood National Forest. The City's residents enjoy a rural lifestyle while still having access to the urban amenities of Portland, located 25 miles away. The topography in the City is quite diverse, ranging from the steep Sandy River Canyon to relatively flat farmland. The areas to the east and south of the City are mostly forested land, and areas to the north and west of the City are primarily farmland.

State Highway 26 passes directly through the center of the city with traffic flow from east to west. Highway 26 is a major thoroughfare for those travelling between the Portland Metro area to Mt. Hood and Central Oregon. There are over 40,000 unique vehicles travelling through daily and a significant commercial trucking presence hauling both hazardous and non-hazardous materials. State Highway 211 runs through the southern edge of the City.

Portland State University shows Sandy's 2023 population at 13,159. The growth rate exceeded 20% over the ten-year census reporting period. Spanning 3.5 miles, Sandy has a population density of 4, 204 people per square mile.

The average household income in Sandy is $98341 with a poverty rate of 5.2%. The median rental costs average is $1,503 per month, and the median house value is $497,00 as of May of 2024. The median age in Sandy is 34.5years, The City has 4,697 housing units of which 74.3% are owner occupied.

Annual events include the Mountain Festival, July 4$^{th}$ Fireworks Celebration, Hood to Coast, Wine in the Woods, Summer Sounds, Starlight Cinema, weekly farmers markets during the summer months, and other family events throughout the year. While these events can be an economic support to the local economy, they also bring challenges such as higher traffic volumes, crowd control, and the potential for civil unrest, as with any event that draws groups of people.

### 2.1.2 Hazards and Threats

The City is exposed to a wide range of natural and human-caused hazards and threats, all of which have the potential to disrupt the community, causing casualties and/or damaging property and the environment. Possible natural hazards include droughts, floods, wildfires, and winter storms.

*See the Natural Hazard Mitigation Plan for more information on natural hazards for the area.*

#### 2.1.2.1 Earthquake

Within the Northern Willamette Valley/Portland Metro Region, three potential faults and/or zones can generate high-magnitude earthquakes affecting the City. These include the Portland Hills Fault Zone, Gales Creek- Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

Historical records show over 56 earthquakes in the Portland metro area. The most severe earthquakes occurred in 1877, 1880, 1953, and 1962. The most recent severe earthquake was the March 25, 1993, Scotts Mills quake, which was a 5.6 magnitude quake, with aftershocks continuing at least through April 8.

#### 2.1.2.2 Severe Storms

In recent years, several storms have caused undue stress on City resources, including the following:

- From December 26, 2003, to January 14, 2004, a severe winter storm covered the City in three inches of ice, and a fire broke out after a power line was pulled down.
- A windstorm from December 14 to 15, 2006, toppled trees onto Highway 26, requiring the highway to be temporarily closed.
- From December 26, 2008, to January 2, 2009, Oregon experienced its worst winter storm in 40 years. City public works crews worked extended hours to clear arterials, but smaller roads could not be cleared quickly due to limited staff and equipment. The City hired private contractors to assist in snow removal efforts, but some citizens could not get out of their homes to purchase food, refill prescriptions, or make medical appointments. Safety officials, City staff, and citizens with four-wheel drive vehicles and snowmobiles helped these citizens



leave their homes to fulfill needed errands. In addition to creating access problems, the snowpack saturated soils with water, and two mudslides occurred.

- Between February 11th and February 15th, 2021, a significant ice storm impacted the city causing power outages along with manpower and resource impacts to Public Works. The City relied on Portland Water Bureau for additional water

- which cost approximately $25,000 upfront and impacts charges at approximately $2,000/month additional on our water bill from Portland into 2022.

- In January of 2024, FEMA declared a severe winter storm for the events that occurred January 10 to January 22, 2024. The events resulted in $250,000 of damage and overtime for downed tress (especially the Tickle Creek Trail) as well as efforts to open roads to assist PGE in restoring power.

### 2.1.2.3 Hazardous Materials

The ever-increasing use of hazardous materials poses a serious threat to life, property, and the environment. These products, which are used in agricultural, industrial, and other modern technologies, are becoming increasingly complex, with many new products developed and introduced annually. Incidents involving the release of hazardous materials may occur during handling at industrial facilities using such materials or during the transportation of such materials by rail or highway.

Union Pacific Railroad's mainline carries thousands of rail cars of hazardous materials through the County each year. Interstate 205 is the designated alternate route to Interstate 5 for through-shipments of hazardous materials. Hazardous materials incidents could include the release of radiological materials in accidents at fixed sites or during transportation or resulting from an accidental weapon detonation. The City also has a major state highway running through the middle of the downtown corridor. Roughly 40,000 cars and large semi-trucks per day, some of which may be carrying hazardous materials, pass through Sandy on Highway 26 on the way to or from the Mount Hood recreational area.

### 2.1.2.4 Flood

The main sources of flooding in the City are Tickle Creek, Cedar Creek, Badger Creek, and numerous drainage ways. Regionally, the Sandy River is a flooding source as well. On January 1–2, 2009, a winter storm event led to flooding throughout many of the smaller tributaries and drainage ways. Some homeowners rerouted the culverts and drainage ways near their homes to protect their property, but this resulted in more damage and flooding to neighbors downstream and to other parts of the City. Some City residents depend on culverts to access their homes. A few of these culverts were washed out, essentially cutting citizens off from their homes. Two trailers were lost, and many homes experienced crawlspace flooding.

### 2.1.2.5 Wildfire

In 1951, approximately 2,000 acres burned in Clackamas and Multnomah Counties. In 2001, lightning strikes started eight fires in eastern Clackamas County on U.S. Forest Service lands, burning about 80 acres. In 2002, the Bowl Fire burned over 300 acres just east of Estacada. The Cascade Range, which

includes the City of Sandy, has a relatively small population, and is characterized by heavily forested slopes. No history of wildfires is reported for Sandy proper.

On September 7th, 2020, the most destructive wildfire event on record in Oregon began with multiple plume driven fires occurring within Clackamas County causing mass evacuations of neighboring cities and unincorporated Sandy. There were over 1 million acres burned, thousands of homes lost, and 11 confirmed deaths attributed to the event. This led to many evacuees coming to Sandy from all over Clackamas County seeking shelter and aid causing significant impacts to essential services, traffic, shelter, and limited resources available within the City.

On Thursday August 24, 2023, a lightning strike sparked a wildfire in the Bull Run Watershed, on the doorstep of Sandy. As Bull Run is the primary water supply of the Portland Water Bureau and the City of Sandy, serving over one million people, this fire quickly grew to the number one fire in the United States, with basecamp firefighting operations based in the City of Sandy. There was a strong possibility of shutting down the Bull Run supply should the fire not be contained, which would have resulted in a 50% curtailment of water for Sandy, an event not seen in the region before.

Note: United States Forest Service region headquarters is located within the City Limits of Sandy, and is used by many other agencies for operations, staging and consumer of resources; particularly in a fire.

### 2.1.2.6 Landslide

Areas within the City that have experienced landslides in the past include Ten Eyck Road, Highway 26, Bluff Road, Barlow Trail, Laughing Water Road, Coalman Road, and Salmon River Road. In 1980, a landslide on Ten Eyck Road closed Highway 26 for 3–4 months. This was one of the biggest impacts that the City has experienced as a result of sliding activity. More recently, landslides occurred on January 1 and 2, 2009. On the night of January 1, a large mudslide to the east of the City closed Highway 26 at milepost 35. At about 1:00 am on January 2, a bank above the old Bill's Automotive location on the south side of Highway 26 gave way and destroyed the building. The slide also damaged a fiber optic cable and took out 911 service for part of the early morning.

### 2.1.2.7 Transportation Accidents

This hazard may include major incidents involving motor vehicles, trains, aircraft,or vessels. An additional hazard is created by a major natural gas pipeline that crosses the County and throughout the City along Highway 26. Hazards increase significantly if incidents include a fire or explosion, a release of hazardous materials, or large numbers of casualties. Railroad tracks carrying both

freight and passenger trains travel through the county. Flight paths for Portland International Airport pass over parts of the City. Motor vehicle risks may include multi-passenger vehicles such as the many buses that carry skiers over dangerous roads on Mount Hood.



### 2.1.2.8 Terrorism

This hazard may include bomb threats, arson, kidnapping, or other violent acts done to intimidate a population or government into granting the demands of the perpetrators. This hazard is most often associated with insurrection, revolution, or making a political statement and may include threats to cause mass death or damage to critical infrastructure. Separatist groups such as cults, survivalists, and militias have used terrorism in the past to gain attention to their cause. A terrorist incident may involve the use of weapons of mass destruction, including biological, nuclear, incendiary, chemical, or explosive materials.

### 2.1.2.9 Volcano

Mount St. Helens' 1980 eruption is well known. Mount Hood, while not as active in recent years, has experienced four major eruptions during the last 15,000 years. The most recent occurred 200-300 years ago. Emissions also occurred in 1859, twice in 1865, and in 1903 when steam and fragments of rock and lava were ejected. During the past 2,000 years, lava domes at Mount Hood have grown and collapsed, creating hundreds of pyroclastic flows extending 7 miles down the mountain's southwest flank. This volcano remains in an active state.

Due to the City's location on the Sandy River and proximity to Mount Hood, the City may experience some of the immediate effects that eruptions have on surrounding areas (e.g., evacuees, ashfall, seismic activity). It is estimated that a lahar resulting from an eruption of Mount Hood would take two hours to reach the City, allowing time for individuals to evacuate if needed. A steep bluff shields the City from the Sandy River, so a lahar should not affect assets within City limits, but could damage the water infrastructure in the Bull Run Reservoir.

## 2.1.3 Capability Assessment

The availability of the City's physical and staff resources may limit the City's capability to conduct short- and long-term response actions on an independent basis. City response capabilities are also limited during periods when essential staff is on vacation, sick, or under furlough due to budgetary constraints. The City has not developed a formal capabilities assessment to date. Should one be developed in the future, it will summarize the jurisdiction's limitations based on training, equipment, and personnel.

## 2.1.4 Hazard Analysis

In the Hazard Analysis **(see table next page**), each of the hazards and threats described is scored using a formula that incorporates four independently weighted rating criteria (history, vulnerability, maximum threat, and probability) and three levels of severity (low, moderate, and high). For each hazard, the score for a given rating criterion is determined by multiplying the criterion's severity rating by its weight factor. The four rating criteria scores for the hazard are then summed to provide atotal risk score for that hazard. Note that while many hazards may occur together or because of others (e.g., dam failures cause flooding, and earthquakes may cause landslides), this analysis considers each hazard as a singular event.

**Table 2-1 Clackamas County Hazard Analysis Matrix**

| Hazard | Rating Criteria with Weight Factors | | | | Total Score |
|---|---|---|---|---|---|
| | History [1] (WF=2) | Vulnerability [2] (WF=5) | Max Threat [3] (WF=10) | Probability [4] (WF=7) | |
| *Score for each rating criteria = Rating Factor (High = 10 points; Moderate = 5 points; Low = 1 point) X Weight Factor (WF)* | | | | | |
| Earthquake-Cascadia | 2 | 45 | 80 | 35 | 162 |
| Earthquake-Crustal | 6 | 50 | 80 | 21 | 157 |
| Public Health Emergency | 8 | 45 | 80 | 35 | 168 |
| Wildfire | 18 | 45 | 100 | 63 | 226 |
| Winter Storm | 14 | 30 | 70 | 49 | 163 |
| HAZMAT Incident | 10 | 30 | 60 | 42 | 142 |
| Drought | 10 | 35 | 100 | 56 | 131 |
| Flood | 10 | 20 | 30 | 56 | 116 |
| Windstorm | 14 | 15 | 50 | 42 | 121 |
| Landslide & DebrisFlow | 14 | 20 | 40 | 63 | 137 |
| Transportation Accident | 4 | 30 | 40 | 28 | 102 |
| Volcano | 2 | 40 | 80 | 7 | 129 |
| Terrorism | 2 | 30 | 40 | 21 | 93 |
| Extreme Heat | 10 | 35 | 70 | 35 | 150 |
| Dam Failure | 2 | 15 | 40 | 7 | 64 |
| Civil Disorder | 6 | 15 | 20 | 14 | 55 |

**Notes:**

1. History addresses the record of previous major emergencies or disasters. Weight Factor is 2. Rating factors: high = 4or more events in last 100 years; moderate = 3 events in last 100 years; low = 1 or 0 events in last 100 years.
2. Vulnerability addresses the percentage of population or property likely to be affected by a major emergency or disaster. Weight Factor is 5. Rating factors: high = more than 10% affected; moderate = 1%-10% affected; low =less than 1% affected.
3. Maximum Threat addresses the percentage of population or property that could be affected in a worst-case incident. Weight Factor is 10. Rating factors: high = more than 25% could be affected; moderate = 5%-25% could be affected; low = less than 5% could be affected.
4. Probability addresses the likelihood of a future major emergency or disaster within a specified period of time. Weight Factor is 7. Rating factors: high = one incident within a 10-year period; moderate = one incident within a 50-year period; low = one incident within a 100-year period.

## 2.2 Assumptions

The assumptions upon which this EOP is predicated are outlined below.

- The City will continue to be exposed to the hazards noted above, as well as others that may develop in the future.
- Outside assistance will be available in most emergency situations affecting the City. Although this plan defines procedures for coordinating such assistance, it is essential for the City to be prepared to carry out disaster response and short-term actions on an independent basis.
- It is possible for a major disaster to occur at any time and at any place in the County. In some cases, dissemination of warning and increased readiness measures may be possible. However, many disasters and events can occur with little or no warning.
- Local government officials recognize their responsibilities for the safety and well-being of the public and will assume their responsibilities in the implementation of this emergency plan.
- Proper implementation of this plan will reduce or prevent disaster-related losses.

# 3 Roles and Responsibilities

## 3.1 General

Local and County agencies and response partners may have various roles and responsibilities throughout an emergency's duration. Therefore, it is particularly important that the local command structure be established to support response and recovery efforts and maintain a significant amount of flexibility to expand and contract as the situation changes. Typical duties and roles may also vary depending on the incident's size and severity of impacts, as well as the availability of local resources. Thus, it is imperative to develop and maintain depth of qualified staff within the command structure and response community.

The County Emergency Management Director is responsible for emergency management planning and operations for the area of the County lying outside the corporate limits of the incorporated municipalities of the County. The Mayor or other designated official of each incorporated municipality (pursuant to city charter or ordinance) is responsible for emergency management planning and operations for that jurisdiction. (These responsibilities may be shared with County Emergency Management under agreement.)

The City of Sandy conducts all emergency management functions in accordance with NIMS. To assist with training and preparing essential response staff and supporting personnel to incorporate ICS/NIMS concepts into all facets of an emergency, each agency is responsible for ensuring that critical staff are identified and trained at a level enabling effective execution of existing response plans, procedures, and policies. The City also works with the Clackamas Fire District and the Oregon Trail School District to enhance the level of emergency response in the community.

During a City-declared disaster, control is not relinquished to County or State authority but remains at the local level for the duration of the event. Some responsibilities may be shared under mutual consent. Most City departments have emergency functions in additional to their normal duties. Each department is responsible for developing and maintaining its own emergency management procedures. Specific responsibilities are outlined below, as well as individual annexes.

## 3.2 Emergency Management Organization

The City does not have an office or division of emergency management services separate from its existing departments. The City Manager (or designee) serves as the Emergency Manager and may, depending on the size or type of incident,

delegatethe authority to lead response and recovery actions to other City staff. Additionally, some authority to act in the event of an emergency may already be delegated by ordinance or by practice. As a result, the organizational structure for the City's emergency management program can vary dependent upon thelocation, size, and impact of the incident.

For the purposes of this plan, the City's emergency management structure will be referred to generally as the City EMO. Under this structure, the City Manager would be considered the Emergency Manager, unless this role has been otherwise delegated. Roles and responsibilities of individual staff and agencies are described throughout the plan to further clarify the City's emergency management structure.

The EMO for the City is divided into two general groups—the Executive Group and Emergency Response Agencies—organized by function.

### 3.2.1 Executive Group

The Executive Group is referred to in this plan as a single body, but it may include representation from each City department during an event. The Executive Group is responsible for the activities conducted within its jurisdiction. The members of the group include both elected and appointed executives with certain legal responsibilities. Key general responsibilities for local elected and appointed officials include:

- Establishing strong working relationships with local jurisdictional leaders and core private-sector organizations, voluntary agencies, and community partners.
- Leading and encouraging local leaders to focus on preparedness by participating in planning, training, and exercises.
- Supporting staff participation in local mitigation efforts within the jurisdiction and, as appropriate, including the private sector.
- Understanding and implementing laws and regulations that support emergency management and response.
- Ensuring that local emergency plans consider the needs of:
    - The jurisdiction, including persons, property, and structures
    - Individuals with special needs, including those with service animals
    - Individuals with household pets.
- Encouraging residents to be prepared and participate in volunteer organizations and training courses.

### 3.2.1.1 Mayor and City Council

The ultimate responsibility for policy, budget, and political direction for the City government is borne by the City Council. During emergencies this responsibility includes encouraging positive support with citizen involvement and citizen assistance, issuing policy statements as needed to support actions and activities of recovery and response efforts, and providing the political contact needed for visiting State and Federal officials. Additionally, the Council will provide elected liaison with the community and other jurisdictions. Chapter 2.80 of the Sandy Municipal Code establishes the process for declaring and terminating a state of emergency.

General responsibilities of the Mayor and City Council include:

- Establishing emergency management authority by City ordinance.
- Adopting an EOP and other emergency management–related resolutions.
- Declaring a State of Emergency and providing support to the IC in requesting assistance through the County.
- Acting as liaison to the community during activation of the EOC.
- Acting on emergency funding needs.
- Attending PIO briefings.

### 3.2.1.2 City Manager

The City Manager is responsible for:

- Ensuring that all City departments develop, maintain, and exercise their respective service annexes to this plan.
- Supporting the overall preparedness program in terms of its budgetary and organizational requirements.
- Implementing the policies and decisions of the governing body.
- Directing the emergency operational response of City services.
- Ensuring, through the City Recorder, that plans are in place for the protection and preservation of City records.

### 3.2.1.3 Emergency Manager

The City Manager (or designee) serves as the Emergency Manager for the City. The Emergency Manager has the day-to-day authority and responsibility for overseeing emergency management programs and activities. The Emergency Manager works with the Executive Group to ensure that there are unified objectives regarding the City's emergency plans and activities, including coordinating all aspects of the City's capabilities. The Emergency Manager coordinates with other components of the local emergency management program, including assessing the availability and readiness of local resources most likely required during an incident and identifying and correcting any shortfalls. In particular, the Emergency Manager is responsible for:

- Serving as staff advisor to the City Council for emergency matters.
- Coordinating the planning and general preparedness activities of the government and maintenance of this plan.
- Analyzing the emergency skills required and arranging the training necessary to provide those skills.
- Preparing and maintaining a resource inventory.
- Ensuring the operational capability of the City EOC.
- Activating the City EOC.
- Keeping the governing body apprised of the City's preparedness status and anticipated needs.
- Serving as day-to-day liaison between the City and County Emergency Management.
- Maintaining liaison with organized emergency volunteer groups and private agencies

### 3.2.1.4 City Department Heads

Department and agency heads collaborate with the Executive Group during development of local emergency plans and provide key response resources. City department and agency heads and their staffs develop, plan, and train to learn internal policies and procedures for meeting response and recovery needs safely. They also make staff available to participate in interagency training and exercise to develop and maintain the necessary capabilities as well as clearly reinforce preparedness expectations. Department and agency heads not assigned a specific function in this plan will be prepared to make their resources available for emergency duty at the direction of the City Manager.

### 3.2.2 Responsibilities of All Departments

Individual departments are an integral part of the emergency organization. While some departments' staff are first responders, the majority focus on supporting these first responders and/or on the continuity of services they provide to the public. Organizationally, they are a component that provides support and communication for responders.

All City departments are response for:

- Supporting EOC operations to ensure that the City is providing for the public safety and protection of the citizens it serves.
- Establish, in writing, an ongoing line of succession of authority for each department; this document must be made known to departmentemployees, and a copy must be filed with the City Manager.
- Develop alert and notification procedures for department personnel.
- Develop operating guidelines to implement assigned duties specified by this plan.
- Track incident-related costs incurred by the department.
- Establish internal lines of succession of authority.
- Ensure that vehicles and other equipment are equipped and ready, in accordance with SOPs.
- Identify critical functions and develop procedures for maintaining and/or reestablishing services provided to the public and other City departments.
- Assign personnel to the EOC, as charged by this plan.
- Develop and implement procedures for protecting vital records, materials, and facilities.
- Promote family preparedness among employees.
- Ensure that staff complete any NIMS-required training.
- Ensure that department plans and standard operating procedures (SOPs) incorporate NIMS components, principles, and policies.
- Allow staff time for preparedness training and participation in exercises.

### 3.2.3 Responsibilities by Function

This group includes services required for an effective emergency management program, of which response is a key element. These agencies include fire departments, law enforcement, emergency medical service (EMS) providers, and the public health, environmental health, and public works departments. This section is organized by function, with the primary responsibility assigned to the appropriate City or County agency.

#### 3.2.3.1 Transportation

*Public Works, Sandy Area Metro Police Department, Wheels with Sandy Area Metro or Sandy Area Metro Transit Department.*

Transportation responsibilities include:

- Planning for and identifying high-hazard areas and numbers of potential evacuees and numbers of people requiring transportation to reception areas (including special needs populations).
- Coordinating transportation needs for special populations.
- Identifying emergency traffic routes.
- Determining optimal traffic flow and movement priority from residences to highways.
- Confirming and managing locations of staging areas and pick-up points for evacuees requiring public transportation.
- Coordinating transportation services, equipment, and personnel using emergency routes.
- Providing guidance on commuting arrangements for essential workers during the evacuation period.
- Proposing locations of roadblocks and patrols for evacuation movement.
- Providing patrols and safety measures in the evacuated area and reassigning personnel during the evacuation period.
- Preparing and maintaining supporting SOPs and annexes.

### 3.2.3.2 Communications

#### Alert and Warning

*Police Department, Clackamas Fire District, City Administration, Oregon Trail School District, Sandynet and Clackamas County Communications (CCOM)*

Alert and warning responsibilities include:

- Disseminating emergency public information, as requested.
- Receiving, verifying, and disseminating warning information to the public and key County and City officials.
- Preparing and maintaining supporting SOPs and annexes.

### Communication Systems

*Police Department, CCOM, Sandynet*

Communication responsibilities include:

- Establishing and maintaining emergency communications systems.
- Coordinating use of all public and private communication systems necessary during emergencies.
- Managing and coordinating all emergency communication within the EOC, once activated.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 2 – Communications for more detail.*

### 3.2.3.3 Public Works and Engineering

*Public Works Department, Development Services Department, Clackamas County Transportation and Development*

City public works agencies are responsible for the following tasks in an emergency:

- Maintaining generator operation of water utility and sewer utility, including fueling operation.
- Protecting and restoring water treatment and distribution systems.
- Coordinating with Regional Consortium to assist in declaring emergencies, and providing mutual aid for emergency water.
- Maintaining emergency access to road systems during snow, ice, debris or other events.

- Barricading hazardous areas.
- Performing priority restoration of streets and bridges.

- Protecting and restoring waste treatment and disposal systems.
- Augmenting sanitation services.
- Assessing damage to streets, bridges, traffic control devices, drinking water systems, stormwater systems, waste-water treatment system, and other public works facilities.
- Removing debris.
- Assessing damage to City-owned facilities.
- Condemning unsafe structures.
- Directing temporary repair of essential facilities.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 3 – Infrastructure Services and the County EOP, ESF 3 – Public Works and Engineering for more detail.*

### 3.2.3.4 Firefighting

*Clackamas County Fire District*

City fire services are responsible for the following tasks during an emergency:

- Providing fire prevention, education, inspection, suppression, and emergency medical aid to prevent loss of life, loss of property, and damage to the environment.
- Inspecting damaged areas for fire and life safety hazards.
- Providing hazardous materials spills containment, clean-up, planning,and coordination.
- Inspecting shelters for fire and life safety hazards and coordinating with the Mass Care Liaison.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 4 – Firefighting for more detail.*

### 3.2.3.5 Emergency Management

#### Emergency Operations Center

*City Administration and Police Department, Clackamas Fire District, and Oregon Trail School District*

The following tasks are necessary for the City to activate and utilize its EOC to support and coordinate response operations during an emergency:

- Directing and controlling local operations resources.
- Maintaining contact with neighboring jurisdictions and the County EOC.
- Maintaining the EOC in an operating mode at all times or ensuring the ability to convert EOC space into an operating condition.
- Assigning representatives (by title) to report to the EOC and developing procedures for crisis training.
- Developing and identifying duties of staff, use of displays and message forms, and procedures for EOC activation.

*See Chapter 5 – Command and Control, FA 1 – Emergency Services, and the County EOP Basic Plan and ESF 5 – Emergency Management for more detail.*

### 3.2.3.6 Mass Care, Emergency Assistance, Housing, and Human Services

*Clackamas County Health, Housing and Human Services, American Red Cross, and Oregon Trail School District*

The City relies on the support of the County to provide Shelter and Mass Care Services and has adopted the procedures outlined in the County EOP. County Health, Housing and Human Services (also referred to as H3S Department), with support from the Oregon Trail Chapter of the American Red Cross, is responsible for ensuring that the mass care needs of the affected population are met, such as sheltering, feeding, providing first aid, and reuniting families. Relevant operations are detailed in the County EOP, ESF 6 – Housing and Human Services and ESF 11 – Agriculture and Natural Resources; general responsibilities include:

- Maintaining the Community Shelter Plan and Animal Disaster Response Plan.
- Supervising the Shelter Management program (stocking, marking, and equipping, etc.) for natural disasters.
- Coordinating support with other City and County departments, relief agencies, and volunteer groups.
- Designating a coordinator/liaison to participate in all phases of the County emergency management program, when necessary or as requested.
- Providing emergency counseling for disaster victims and emergency response personnel suffering from behavioral and emotional disturbances.
- Coordinating with faith-based organizations and other volunteer agencies.
- Identifying emergency feeding sites (coordinating with the American Red Cross and Salvation Army).
- Identifying sources of clothing for disaster victims (may coordinate with the Salvation Army or other disaster relief organization).
- Securing sources of emergency food supplies (with the American Red Cross and Salvation Army).
- Coordinating operation of shelter facilities operated by the City or County, local volunteers, or organized disaster relief agencies such as the American Red Cross.
- Coordinating special care requirements for sheltered groups such as unaccompanied children and the elderly.

*See FA 2 – Human Services and the County EOP, ESF 6 – Mass Care, Emergency Assistance, Housing, and Human Services and ESF 11 – Agriculture and Natural Resources for more detail.*

### 3.2.3.7 Logistics Management and Resource Support

*City Administration, Finance, Human Resources, and County Emergency Management*

The following tasks are necessary to identify and acquire resources before and during an emergency:

- Establishing procedures for employing temporary personnel for disaster operations.
- In cooperation with the Police Department, establishing and

maintaining a staffing reserve

- Coordinating deployment of reserve personnel to City departments requiring augmentation.
- Establishing emergency purchasing procedures and/or a disaster contingency fund.
- Maintaining records of emergency-related expenditures for purchases and personnel.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 7 – Logistics Management and Resource Support for more detail.*

### 3.2.3.8 Public Health and Emergency Medical Services

*Clackamas County Health, Housing and Human Services, and American Red Cross*

The City relies on the County to provide public health and human services and has adopted the relevant parts of the County EOP. The County Health, Housing and Human Services Director is responsible for coordinating the public health and welfare services required to cope with the control of communicable and non-communicable diseases associated with major emergencies, disasters, and/or widespread outbreaks caused by bioterrorism, epidemic or pandemic diseases, or novel and highly fatal infectious agents or biological or chemical toxin incidents in urban or rural areas in the County. The Health, Housing and Human Services Director also serves as the Health Department representative for the County EMO. Relevant operations are detailed in the County EOP, ESF 6 – Housing and Human Services and ESF 8 – Public Health and Medical Services; general responsibilities include:

- Coordinating with hospitals, clinics, nursing homes/care centers, and behavioral health organizations, including making provisions for the "special needs" population.
- Coordinating with the Medical Examiner and Funeral Directors to provide identification and disposition of the dead.
- Coordinating mass vaccination chemoprophylaxis.
- Coordinating isolation and/or quarantine of infected persons.
- Coordinating delivery and set-up of the National Pharmaceutical Stockpile Plan.
- Providing emergency counseling for disaster victims and emergency response personnel suffering from behavioral and emotional disturbances.

- Coordinating for Council of Churches and other volunteer agencies.

*See FA 2 – Human Services and the County EOP, ESF 8 – Public Health and Medical Services for more detail.*

#### Emergency Medical Services

*Clackamas Fire District, Clackamas Fire District, and American Medical Response (AMR)*

EMS providers are responsible for:

- Coordinating provision of EMS.
- Requesting additional EMS assets as necessary.

*See FA 1 – Emergency Services and the County EOP, ESF 8 – Public Health and Medical Services for more detail.*

### 3.2.3.9 Search and Rescue

*Clackamas County Sheriff's Office*

The Sheriff's Office is responsible for:

- Coordinating available resources to search for and rescue persons lost outdoors.
- Cooperating with and extending assistance to surrounding jurisdictions, on request and as resources allow.
- Establishing and monitoring training standards for certification of search and rescue personnel.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 9 – Search and Rescue for more detail.*

### 3.2.3.10 Oil and Hazardous Materials Response

*Clackamas Fire District and Office of State Fire Marshal Regional HazMat TeamNo. 3*

#### Hazardous Materials Response

Oil and Hazardous Materials responsibilities include:

- Conducting oil and hazardous materials (chemical, biological, etc.) response.
- Assessing the health effects of a hazardous materials release.

- Identifying the needs for Hazardous Materials incident support from regional and State agencies.
- Disseminating protective action.
- Conducting environmental short- and long-term cleanup.
- Preparing and maintaining supporting SOPs and annexes.

#### Radiological Protection

General responsibilities include:

- Establishing and maintaining a radiological monitoring and reporting network.
- Securing initial and refresher training for instructors and monitors.
- Providing input to the Statewide monitoring and reporting system.
- Under fallout conditions, providing City and County officials and department heads with information regarding fallout rates, fallout projections, and allowable doses.
- Coordinating radiological monitoring throughout the County.
- Providing monitoring services and advice at the scene of accidents involving radioactive materials.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 10 – Oil and Hazardous Materials for more detail.*

### 3.2.3.11 Agriculture and Natural Resources

*Clackamas County Health, Housing and Human Services*

Agriculture and Natural Resources–related responsibilities include:

- Providing nutrition assistance.
- Conducting animal and plant disease and pest response.
- Monitoring food safety and security.
- Providing natural and cultural resources and historic properties protection and restoration.
- Protecting the safety and well-being of household pets.

*See FA 2 – Human Services and the County EOP, ESF 11 – Agriculture and Natural Resources for more detail.*

### 3.2.3.12 Energy and Utilities

*City Administration, Public Works, and Public/Private Utilities*

Energy and utilities related responsibilities include:

- Working with local energy facilities to restore damaged energy utility infrastructure and accompanying systems.
- Coordinating temporary emergency power generation capabilities to support critical facilities until permanent restoration is accomplished. Critical facilities may include primary and alternate EOCs, hospitals/critical care facilities, designated shelters, government offices/facilities, water/sewage systems, and other essential community services.

*See FA 3 – Infrastructure Services and the County EOP, ESF 12 – Energy for more detail.*

#### 3.2.3.13 Law Enforcement Services

*Police Department*

City enforcement services are responsible for the following tasks:

- Protecting life and property and preserving order.
- Providing law enforcement and criminal investigation.
- Providing traffic, crowd control, and site security.
- Isolating damaged area.
- Providing incident security.
- Providing public information officers
- In cooperation with CCOM, serving as the City Alert and Warning and activation point.
- Providing security for vital/critical facilities, including the EOC, shelters, etc.
- Directing incident/site security.
- Providing support to Fire, Community Development, and Public Works departments' emergency operations as requested and within capability.
- Developing alternate dispatch plans in the event that 911 service is interrupted.
- Preparing and updating the City's Evacuation Plan.
- Providing damage reconnaissance and reporting.
- Evacuating disaster areas.

- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 13 – Public Safety and Security for more information.*

### 3.2.3.14 Recovery

*City Administration and multiple other agencies*

Recovery-related responsibilities include:

- Directing emergency recovery in times of disaster by providing leadership in coordinating private and governmental sector emergency recovery efforts.
- Participating with County and State partners in conducting damage assessments. Identifying and facilitating availability and use of recovery funding.
- Accessing recovery and mitigation grant and insurance programs.
- Providing outreach, public education, and community involvement in recovery planning.
- Coordinating logistics management and resource support, providing assistance as needed.
- Providing support by locating, purchasing, and coordinating delivery of resources necessary during or after an incident in the City.

*See FA 4 – Recovery Strategy and the County EOP, ESF 14 – Long-Term Community Recovery for more detail.*

### 3.2.3.15 External Affairs

*City Administration*

The following tasks are necessary to ensure provision of reliable, timely, and effective information/warnings to the public at the onset of, and throughout, a disaster:

- Conducting ongoing hazard awareness and public education programs.
- Compiling and preparing emergency information for the public in case of emergency.
- Arraigning for media representatives to receive regular briefings on the City's status during extended emergency situations.
- Securing printed and photographic documentation of the disaster situation.

- Handling scheduled and unscheduled inquiries from the media and the public.
- Being aware of Spanish-only-speaking and/or bilingual population centers within the City and County and preparing training and news releases accordingly.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 15 – External Affairs for more detail.*

### 3.2.3.16 Evacuation and Population Protection

*Police Department, and Clackamas Fire District*

The following tasks are necessary to implement and support protective actions by the public and coordinate an evacuation:

- Defining responsibilities of City departments and private-sector groups.
- Identifying high hazard areas and corresponding number of potential evacuees.
- Coordinating evacuation planning, including:
  - Movement control
  - Health and medical requirements
  - Transportation needs
  - Emergency public information materials
  - Shelter and reception location.
- Developing procedures for sheltering in place.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services for more details.*

### 3.2.3.17 Damage Assessment

*Building Department*

The Building Department is responsible for:

- Establishing a damage assessment team from among City departments with assessment capabilities and responsibilities.
- Training and providing damage plotting team members to the EOC.

- Assisting in reporting and compiling information regarding deaths, injuries, and dollar damage to tax-supported facilities and to private property.
- Assisting in determining the geographic extent of the damaged area.
- Compiling estimates of damage for use by City officials in requesting disaster assistance.
- Evaluating the effect of damage on the City's economic index, tax base, bond ratings, insurance ratings, etc. for use in long-range recovery planning.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 4 – Recovery strategy for more details.*

#### 3.2.3.18 Legal Services

*City Counsel (Beery, Elsner & Hammond, LLP)*

City Counsel is responsible for the following tasks in the event of an emergency:

- Advising City officials regarding the emergency powers of local government and necessary procedures for invocation of measures to:
  - Implement wage, price, and rent controls
  - Establish rationing of critical resources
  - Establish curfews
  - Restrict or deny access
  - Specify routes of egress
  - Limit or restrict use of water or other utilities
  - Remove debris from publicly or privately owned property.
- Reviewing and advising City officials regarding possible liabilities arising from disaster operations, including the exercising of any or all the above powers.
- Preparing and recommending local legislation to implement the emergency powers required during an emergency.

- Advising City officials and department heads regarding record keeping requirements and other documentation necessary for the exercising of emergency powers.
- Thoroughly reviewing and maintaining familiarity with current ORS 401 provisions as they apply to County or City government in disaster events.
- Preparing and maintaining supporting SOPs and annexes.

#### 3.2.3.19 Volunteer and Donation Management

*Community Services, Finance Department, and Human Resources*

Responding to incidents frequently exceeds the City's resources. Volunteers and donors can support response efforts in many ways, and it is essential that the City plan to effectively incorporate volunteers and donated goods into its response activities. This plan should:

- Assign liaison to staff the EOC to coordinate social services and donations.
- Establish a system for matching unmet needs with offers of assistance based on the incident and transition into Long-term Recovery team as appropriate.
- Coordinate efforts between the local and County COAD.
- Participate in trainings and exercises.

#### 3.2.3.20 Other Agency Responsibilities

Other City department and agency heads not assigned a specific function in this plan will be prepared to make their resources (including personnel) available for emergency duty at the direction of the City Manager.

## 3.3 Local and Regional Response Partners

The City's emergency organization is supported by several outside organizations, including the County, service organizations, and the private sector.

### 3.3.1 Private Sector

Private-sector organizations play a key role before, during, and after an incident. First, they must provide for the welfare and protection of their employees in the workplace. In addition, the City and County must work seamlessly with businesses that provide water, power, communication networks, transportation, medical care, security, and numerous other services upon which both response and recovery are particularly dependent. Essential private-sector responsibilities include:

- Planning for the protection of employees, infrastructure, and facilities.
- Planning for the protection of information and the continuity of business operations.
- Planning for, responding to, and recovering from, incidents that impact private-sector infrastructure and facilities.
- Collaborating with emergency management personnel before an incident occurs to ascertain what assistance may be necessary and how private-sector organizations can help.
- Developing and exercising emergency plans before an incident occurs.
- Where appropriate, establishing mutual aid and assistance agreements to provide specific response capabilities.
- Providing assistance (including volunteers) to support local emergency management and public awareness during response and throughout the recovery process.

### 3.3.2 Nongovernmental Organizations

Nongovernmental organizations (NGOs) play enormously important roles before, during, and after an incident. In the City, NGOs such as the American Red Cross provide sheltering, emergency food supplies, counseling services, and other vital support services to support response and promote the recovery of disaster victims. NGOs collaborate with responders, governments at all levels, and other agencies and organizations.

The roles of NGOs in an emergency may include:

- Training and managing volunteer resources.
- Identifying shelter locations and needed supplies.

- Providing critical emergency services to those in need, such as cleaning supplies, clothing, food and shelter, and assistance with post-emergency cleanup.
- Identifying those whose needs have not been met and helping coordinate the provision of assistance.

### 3.3.3 Individuals and Households

Although not formally a part of the City's emergency operations, individuals, and households play an important role in the overall emergency management strategy. Community members can contribute by:

- Reducing hazards in their homes.
- Preparing emergency supply kits and household emergency plans.
- Monitoring emergency communications carefully.
- Volunteering with established organizations.
- Enrolling in emergency response training courses.

## 3.4 County Response Partners

The County Emergency Management Director has been appointed under the authority of the Board of County Commissioners. The County Emergency Management Director is responsible for developing a Countywide emergency management program that, through cooperative planning efforts with the incorporated communities of the County, will provide a coordinated response to a major emergency or disaster.

*See the County Emergency Operations Plan for details on the County's emergency management organization and detailed roles and responsibilities for County Departments.*

## 3.5 State Response Partners

Under the provisions of ORS 401.055 through 401.155, the Governor has broad responsibilities for the direction and control of all emergency activities in a State-Declared Emergency. The administrator of OEM is delegated authority by ORS 401.260 to 401.280 to coordinate all activities and organizations for emergency management within the State and to coordinate in emergency matters with other states and the Federal government.

Under the direction and control of department heads, agencies of State government represent the State emergency operations organization. Responsibility for conducting emergency support functions is assigned by the Governor to the department best suited to carry out each function applicable to the emergency. State agencies may call upon their Federal counterparts to provide additional support and resources following established procedures and policies.

*See the State of Oregon Emergency Operations Plan for details on the State's emergency management organization and detailed roles and responsibilities for State departments.*

## 3.6 Federal Response Partners

Federal response partners are typically requested by OEM in the event that State resources become limited or specialized services are needed. In most instances, Federal resources become available following a formal declaration of emergency by the Governor. Thus, procedures and policies for allocating and coordinating resources at the Federal level follow the Oregon EMP and, if necessary, the NRF.

*See the NRF for details on the Federal government's emergency management organization and detailed roles and responsibilities for Federal departments.*

## 3.7 Response Matrix

Table 3-1 (**starts on next page**) provides a matrix, by ESF, of the local, State, and Federal primaryorganizations that the City may rely on in the event of an emergency.

**Table 3-1 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 1 Transportation** | ■ Aviation/airspace management and control<br>■ Transportation safety<br>■ Restoration and recovery of transportation infrastructure<br>■ Movement restrictions<br>■ Damage and impact assessment | City Public Works Department<br>Sandy Area Metro | Dept. of Transportation and Development | Department of Transportation | Department of Transportation |
| **ESF 2 Communications** | ■ Coordination with telecommunications and information technology industries including SandyNet<br>■ Restoration and repair of telecommunications infrastructure<br>■ Protection, restoration, and sustainment of national cyber and information technology resources<br>■ Oversight of communications within the Federal incident management and response structure | City Police Department<br>City Administration | Emergency Management<br>CCOM<br>Sheriff's Office<br>CARES | Oregon Emergency Management<br>Public Utility Commission | Department of Homeland Security (National Protection and Programs/ Cyber security and Communications/ National Communications System),<br>Department of Homeland Security (Federal Emergency Management Agency) |
| **ESF 3 Public Works & Engineering** | ■ Infrastructure protection and emergency repair<br>■ Infrastructure restoration<br>■ Engineering services and construction management<br>■ Emergency contracting support for lifesaving and life-sustaining services | City Public Works Department | Dept. of Transportation and Development | Department of Transportation | Department of Defense (U.S. Army Corps of Engineers)<br>Department of Homeland Security (FEMA) |

**Table 3-1 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 4 Firefighting** | ■ Coordination of Federal firefighting activities<br>■ Support to wildland, rural, and urban firefighting operations | Clackamas Fire Dist. | Emergency Management<br>Fire Defense Board | Department of Forestry<br>Office of the State Fire Marshal | Department of Agriculture (U.S. Forest Service) |
| **ESF 5 Emergency Management** | ■ Coordination of incident management and response efforts<br>■ Issuance of mission assignments<br>■ Resource and human capital<br>■ Incident action planning<br>■ Financial management | City Administration<br>City Police Department<br>Clackamas Fire District | Emergency Management | Oregon Emergency Management | Department of Homeland Security (FEMA) |
| **ESF 6 Mass Care, Emergency Assistance, Housing & Human Services** | ■ Mass care<br>■ Emergency assistance<br>■ Disaster housing<br>■ Human services | City Administration<br>American Red Cross | Health, Housing and Human Services | Department of Human Services<br>Oregon Health Authority | Department of Homeland Security (FEMA) |
| **ESF 7 Logistics Management & Resource Support** | ■ Comprehensive, national incident logistics planning, management, and sustainment capability<br>■ Resource support (facility space, office equipment and supplies, contracting services, etc.) | City Administration<br>Clackamas Fire District<br>Sandy Area Metro | Emergency Management | Oregon Military Department<br>Department of Administrative Services | General Services Administration<br>Department of Homeland Security (FEMA) |
| **ESF 8 Public Health & Medical Services** | ■ Public health<br>■ Medical services<br>■ Behavioral health services<br>■ Mass fatality management | City Administration (Coordinate with Health Dept.)<br>Clackamas Fire District<br>American Medical Response<br>Local Clinics | Health, Housing and Human Services<br>Local Hospitals<br>Local Emergency Medical Services | Department of Human Services (Public Health Division) | Department of Health and Human Services |

**Table 3-1 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 9 Search & Rescue** | ■ Life-saving assistance<br>■ Search and rescue operations | City Police Department | Sheriff's Office<br>Fire Defense Board | Oregon Emergency Management<br>Office of the State Fire Marshal | Department of Homeland Security (FEMA, U.S. Coast Guard)<br>Department of the Interior (National Park Service)<br>Department of Defense |
| **ESF 10 Oil & Hazardous Materials** | ■ Oil and hazardous materials (chemical, biological, radiological, etc.) response<br>■ Environment short- and long-term cleanup | Clackamas Fire District<br>Regional Hazardous Materials Team | Emergency Management<br>Fire Department | Department of Environmental Quality<br>Office of the State Fire Marshal | Environmental Protection Agency<br>Department of Homeland Security (U.S. Coast Guard) |
| **ESF 11 Agriculture & Natural Resources** | ■ Nutrition assistance<br>■ Animal and plant disease and pest response<br>■ Food safety and security<br>■ Natural and cultural resources and historic properties protection<br>■ Safety and well-being of household pets | City Administration | Emergency Management<br>Health, Housing and Human Services<br>Dog Services (DTD)<br>Oregon State University Extension | Department of Agriculture | Department of Agriculture<br>Department of Interior |
| **ESF 12 Energy** | ■ Energy infrastructure assessment, repair, and restoration<br>■ Energy industry utilities coordination<br>■ Energy forecast | City Administration<br>Local Utilities | Emergency Management | Department of Energy<br>Public Utility Commission | Department of Energy |

**Table 3-1 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 13 Public Safety & Security** | ■ Facility and resource security<br>■ Security planning and technical resource assistance<br>■ Public safety and security support<br>■ Support to access, traffic, and crowd control | City Police Department | Sheriff's Office | Department of Justice<br>Oregon State Police<br>Department of Administrative Services | Department of Justice |
| **ESF 14 Long-Term Community Recovery** | ■ Social and economic community impact assessment<br>■ Long-term community recovery assistance to States, tribes, local governments, and the private sector<br>■ Analysis and review of mitigation program implementation | City Administration | Emergency Management<br>Health, Housing and Human Services | Oregon Business Development Department<br>Oregon Emergency Management<br>Governor's Recovery Planning Cell (Governors Recovery Cabinet) | Department of Agriculture<br>Department of Homeland Security<br>Department of Housing and Urban Development<br>Small Business Administration |
| **ESF 15 External Affairs** | ■ Emergency public information and protective action guidance<br>■ Media and community relations<br>■ Congressional and international affairs<br>■ Tribal and insular affairs<br>■ | City Administration<br>Oregon Trail School District<br>Clackamas Fire District | Public and Government Affairs | Governor's Office<br>Oregon Emergency Management | Department of Homeland Security (FEMA) |

# 4 Concept of Operations

## 4.1 General

Primary roles involved during the initial emergency response will focus on first responders, such as fire districts and police departments, sometimes also involving hospitals/clinics, local health departments, and regional fire and hazardous materials teams. Typically, as the emergency evolves and the immediate response subsides, a transition period will occur during which emergency responders will hand responsibility for active coordination of the response to agencies or organizations involved with recovery operations. In all emergency situations and circumstances, saving and protecting human lives receive priority.

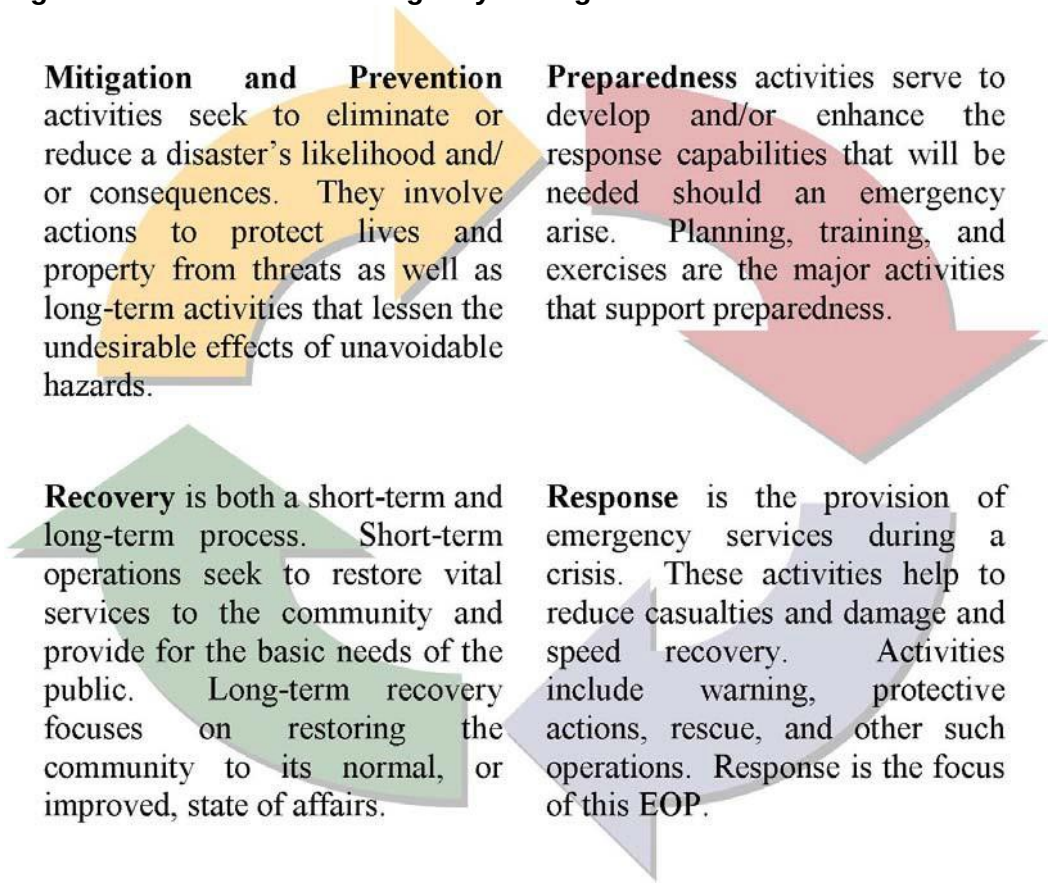
The basic concept of emergency operations focuses on managing and using all available resources at the local level for effectively responding to all types of emergencies. Local government has the primary responsibility for emergency management functions and for protecting life and property from the effects of emergencies and disaster events. This EOP should be used when the City of Sandy or local emergency response agencies are reaching or have exceeded their abilities to respond to an emergency incident and not in response to day-to-day operations.

Responsibilities include management and coordination of large-scale events, identifying and obtaining additional assistance and resources for emergency response agencies from the County, State, and/or Federal government through the City EMO.

## 4.2 Phases of Emergency Management

This plan adheres to the emergency management principle of all-hazards planning, which is predicated on the fact that most responsibilities and functions performed during an emergency are not hazard-specific. It should be noted that this is an emergency operations plan rather than a comprehensive emergency management plan, as its emphasis is on incident management rather than on program management. This EOP impacts and is informed by activities conducted before and after any emergency operations take place. A brief description of the four phases of emergency management is provided below.

**Figure 4-1 Phases of Emergency Management**




This plan will be implemented in the context of a continuous stream of incidents, events, and occurrences, any of which may develop into an emergency. Constant situational awareness is essential to maintaining a forward-leaning posture that facilitates rapid response. Situational awareness refers to the ongoing process of collecting, analyzing, and disseminating intelligence, information, and knowledge to allow organizations and individuals to anticipate requirements and to react quickly and effectively. Situational awareness comprises an interactive process of sharing and evaluating information from multiple sources, integrating communications, and reporting activities, and forecasting or predicting incidents todetect and monitor threats and hazards. These activities are the basis for advice, alert and warning, intelligence and information-sharing, technical assistance, consultations, notifications, and informed decision making at all interagency and intergovernmental levels, as well as on the part of the private sector and the public.

## 4.3 Incident Levels

Incident levels assist response agencies in recognizing the degree of intensity and potential impact of a particular situation. Emergency situations will not always fit

neatly into these levels, and any incident has the potential to intensify and expand. Special circumstances or external pressures may warrant outside assistance for relatively minor incidents.

### 4.3.1 Level 1

Level 1 situations are often referred to as "routine" crisis management or emergency situations that can be handled using resources available at the incident location. For these situations, it may not be necessary to implement an emergency plan. Outside assistance is usually not required.

### 4.3.2 Level 2

Level 2 situations are characterized by a need for response assistance from outside agencies (specialized equipment or personnel, insufficient or inadequate on-site resources, etc.). Requests for assistance related to Level 2 situations often take the form of a 911 call for police, fire, or medical assistance. Examples include hazardous materials spills and traffic incidents with multiple injuries. The IC may implement selected portions of the City EOP.

### 4.3.3 Level 3

Level 3 situations are major incidents that require application of a broad range of community resources to save lives and protect property. Examples of such situations include an airliner crash in populated area, a major earthquake, etc. Emergency plans should be implemented, and the EOC will be activated to coordinate response and recovery activities.

### 4.3.4 NIMS Incident Levels

While the City uses incident levels that are consistent with the County and State EOP's, incident types at the Federal level are based on the following five levels of complexity. (Source; US Fire Administration)

| Table 4-1 | NIMS Incident Levels |
|---|---|
| **Type 5** | ■ The incident can be handled with one or two single resources with up to six personnel.<br>■ Command and General Staff positions (other than the IC) are not activated.<br>■ No written Incident Action Plan (IAP) is required.<br>■ The incident is contained within the first operational period and often within an hour to a few hours after resources arrive on scene.<br>■ Examples include a vehicle fire, an injured person, and a police traffic stop. |

| Table 4-1 | NIMS Incident Levels (continued) |
|---|---|
| Type 4 | ■ Command staff and general staff functions are activated only if needed.<br>■ Several resources are required to mitigate the incident.<br>■ The incident is usually limited to one operational period in the control phase.<br>■ The agency administrator may have briefings and may ensure that the complexity analysis and delegation of authority are updated.<br>■ No written IAP is required, but a documented operational briefing will be completed for all incoming resources.<br>■ The role of the agency administrator includes operational plans that contain objectives and priorities. |
| Type 3 | ■ When capabilities exceed initial attack, the appropriate ICS positions should be added to match the complexity of the incident.<br>■ Some or all the Command and General Staff positions may be activated, as well as the Division/Group Supervisor and/or Unit Leader level positions.<br>■ A Type 3 Incident Management Team or incident command organization manages initial action incidents with a significant number of resources, an extended attack incident until containment/control is achieved, or an expanding incident until transition to a Type 1 or 2 team.<br>■ The incident may extend into multiple operational periods.<br>■ A written IAP may be required for each operational period. |

| Table 4-1 | NIMS Incident Levels (continued) |
|---|---|
| Type 2 | ■ This type of incident extends beyond the capabilities for local control and is expected to go into multiple operational periods. A Type 2 incident may require the response of resources out of area, including regional and/or national resources, to effectively manage the operations, command, and general staffing.<br>■ Most or all the Command and General Staff positions are filled.<br>■ A written IAP is required for each operational period.<br>■ Many of the functional units are needed and staffed.<br>■ Operations personnel normally do not exceed 200 per operational period and total incident personnel do not exceed 500 (guidelines only).<br>■ The agency administrator is responsible for the incident complexity analysis, agency administrator briefings, and the written delegation of authority. |
| Type 1 | ■ This type of incident is the most complex, requiring national resources to manage and operate safely and effectively.<br>■ All Command and General Staff positions are activated.<br>■ Operations personnel often exceed 500 per operational period, and total personnel will usually exceed 1,000.<br>■ Branches need to be established.<br>■ The agency administrator will have briefings and will ensure that the complexity analysis and delegation of authority are updated.<br>■ Use of resource advisors at the incident base is recommended.<br>■ There is a high impact on the local jurisdiction, requiring additional staff for office administrative and support functions. |

## 4.4 Response Priorities

1. **Lifesaving/Protection of Property**: Saving lives receives top priority. Such efforts may include prevention or mitigation of major property damage if results of such damage would likely present an immediate danger to human life.

2. **Incident Stabilization**: Second priority is given to protecting mobile response resources, isolating impacted areas, and containing the incident (if possible).

3. **Property Conservation**: Third priority is given to protecting public facilities essential to life safety/emergency response, protection of the environment whenever public safety is threatened, and protection of private property.

## 4.5 Incident Management

### 4.5.1 Activation

When an emergency arises, and it is determined that the normal organization and functions of City government are insufficient to effectively meet response requirements, the City Council or City Manager will activate and implement all or part of this EOP. In addition, the City Manager, Fire Chief, Police Chief, or Emergency Manager, or their designees, may partially or fully activate and staff the City EOC based on an emergency's type, size, severity, andanticipated duration. An Emergency Declaration is not required to implement theEOP or activate the EOC. The Emergency Manager may implement the EOP as deemed appropriate for the situation or at the request of an IC. Concurrently, all involved City emergency services will implement their respective plans, procedures, and processes and will provide the Emergency Manager with the following information:

- Operational status.
- Readiness and availability of essential resources.
- Changing conditions and status of resources (personnel, equipment, facilities, supplies, etc.).
- Significant concerns and issues dealing with potential or actual loss of life or property.

### 4.5.2 Initial Actions

Upon activation of all or part of this EOP, the IC (or designee) will immediately take the following actions:

- Alert threatened populations and initiate evacuation as necessary. *See FA 1 – Emergency Services Annex for more detail.*
- Initiate emergency sheltering procedures with the American Red Cross and other community partners if evacuation procedures are activated. *See FA 2 – Human Services Annex for more detail.*
- Instruct appropriate City emergency service providers to activate necessary resources.

- Assign radio frequencies and communications equipment, implement a communications plan, and confirm interoperability among EOC staff and response agencies.

- Request a formal Declaration of Emergency pursuant to SMC 2.80 when it is determined that local resources will not meet the needs of local emergency operations. The official declaration may be preceded by a verbal statement.

- Prepare to staff the City EOC as appropriate for the incident with maximum 12-hour shifts.

- City personnel and support staff will be deployed to restore normal activity and provide essential community services as soon as possible following the emergency. *See FA 4 – Recovery Strategy Annex for additional information regarding community recovery procedures.*

### 4.5.3 Communications, Notifications and Warnings

Traditional communication lines, such as landline telephones, cellular phones, faxes, pagers, internet/e-mail, and radio, will be used by City response personnel throughout the duration of response activities. The EOC will also maintain and utilize the 800-megahertz and VHF radio systems as well as Ham and FRS/GMRS. *See FA 1 – Emergency Services for more detail.*

A public warning and broadcast system is under development for the City to provide emergency information and instructions during a pending or actual emergency incident or disaster. The EOC Group shall provide the public with educational/instructional materials and presentations on subjects regarding safety practices and survival tactics for the first 72 hours of a disaster through the Sandy Community Radio. FA 1 – Emergency Services provides detailed information regarding how these systems are accessed, managed, and operated throughout an emergency's duration. Emergency notification procedures are established among the response community. These procedures and call-down lists are available through the front desk of the police department. Additionally, CCOM maintains contact lists of police employees. External partners can be activated and coordinated through the City EOC.

Plain language will be used during any multi-jurisdictional emergency response occurring in the City and is essential to public safety, especially the safety of first responders and those affected by the incident. The use of common terminology enables area commanders, State and local EOC personnel, Federal operational coordinators, and responders to communicate clearly with each other and effectively coordinate response activities, regardless of an incident's size, scope, or complexity. The ability of responders from different jurisdictions and different disciplines to work together depends greatly on their ability to communicate with each other.

#### 4.5.3.1 Interoperability

The City will maintain the ability of emergency management/response personnel to interact and work well together. In the context of technology, interoperability also refers to having an emergency communications system that is the same or is linked to the same system that a jurisdiction uses for nonemergency procedures, and that effectively interfaces with national standards as they are developed. The system should allow the sharing of data with other jurisdictions and levels of government during planning and deployment.

### 4.5.4 Direction and Control

Direction and control of City emergency operations will be conducted via ICS and the Multi-Agency Coordination System, as described in Section 5, Command and Control.

The City EMO is responsible for maintaining the readiness of the EOC and identifying and training support staff. City departments will be requested to designate personnel who can be made available to be trained by City Emergency Management and to work in the EOC during a major disaster. Other departments may be requested to aid in a major emergency.

### 4.5.5 Demobilization

As the emergency progresses and the immediate response subsides, a transition period will occur during which emergency responders will hand responsibility for active coordination of the response to agencies or organizationsinvolved with short- and long-term recovery operations.

### 4.5.6 Transition to Recovery

Recovery comprises steps that the City will take during and after an emergency to restore government function and community services to levels existing prior to the emergency. Recovery is both a short- and long-term process. Short-term operations seek to restore vital services to the community and provide for the basic needs of the public, such as bringing necessary lifeline systems (e.g., power, communication, water and sewage, disposal of solid and hazardous wastes, or removal of debris) to an acceptable standard while providing for basic human needs (e.g., food, clothing, and shelter). Once stability is achieved, the City can concentrate on long-term recovery efforts, which focus on restoring the community to a normal or improved state of affairs. The recovery period is also an opportune time to institute mitigation measures, particularly those related to the recent emergency. This is also the phase of reassessing applications, processes, and functions of all annexes of this disaster plan for deficiencies. Resources to restore or upgrade damaged areas may be available if it can be shown that extra repairs will mitigate or lessen the chances of, or damages caused by, another similar disaster in the future.

*See FA 4 – Recovery Strategy for more detail.*

# 4.6 Inter-jurisdictional Coordination

## 4.6.1 Municipalities

The City is responsible for the direction and control of its local resources during emergencies, including requesting additional resources from mutual aid resources. For resources not covered under mutual aid, requests shall be directed to County Emergency Management, including any requests for a State Declaration of Emergency or presidential disaster declaration.

## 4.6.2 Mutual Aid

State law (ORS 402.010 and 402.015) authorizes the City to enter into Cooperative Assistance Agreements with public and private agencies in accordance with their needs. Personnel, supplies, and services may be used by a requesting agency if the granting agency cooperates and extends such services.

State law (ORS 402.210) authorizes the creation of an intrastate mutual assistance compact among local governments within the State. The compact streamlines the process by which a local government requests assistance and temporarily acquires resources.

## 4.6.3 Special Service Districts

Clackamas Fire District is a special service district providing fire protection to the City. This district is governed by an the Clackamas County Commissioners and has policies and procedures separate from City and County government. Special service districts often overlap City and County boundary lines and thus may serve as primary responders to emergencies within their service districts.

## 4.6.4 Private Sector

Disaster response by local government agencies may be augmented by business, industry, and volunteer organizations. The Emergency Manager, or designee, will coordinate response efforts with business and industry. This includes providing assistance, as appropriate, in action taken by industry to meet State emergency preparedness regulations governing businesses, such as utility companies, that provide essential services. Schools, hospitals, nursing/care homes and other institutional facilities are required by Federal, State, or local regulations to have disaster plans. The PIO will also work with voluntary organizations to provide certain services in emergency situations, typically through previously established agreements. In the preparedness context, essential training programs will be coordinated by the sponsoring agencies of such organizations as the American Red Cross, faith-based groups, amateur radio clubs, Community Emergency Response Teams (CERT), etc.

### 4.6.5 County Government

The County EMO, as defined in the County EOP, can be activated through County Emergency Management. The County provides direct County agency support at the local level and serves as a channel for obtaining resources from outside the County structure, including the assistance provided by State, regional, and Federal agencies. Local resources (personnel, equipment, funds, etc.) should be exhausted or projected to be exhausted before the County requests State assistance.

### 4.6.6 State Government

The State emergency organization, as defined in the State of Oregon EOP, can be activated through OEM. This department always provides a duty officer. The State provides direct agency support to the local level and serves as a channel for obtaining resources from outside the State structure, including the assistance provided by the Federal government.

### 4.6.7 Federal Government

The County shall make requests for Federal disaster assistance to OEM. Federal resources may be requested and provided prior to the formal declaration of a disaster in emergency response situations. A Presidential Disaster Declaration makes available extensive disaster response and recovery assistance, including financial support to governments, businesses, and individual citizens.

# 5 Command and Control

## 5.1 General

Chapter 2.80 of the Sandy Municipal Code establishes the responsibility for emergency management, direction, and control of City departments in a time of emergency. It also establishes the process for declaring and terminating a formal state of emergency. During an emergency the Fire Chief and/or the Police Chief (or designee) becomes the IC and is responsible for performing such duties as causing emergency measures to be enforced and designating emergency areas.

The City Manager (or designee) is responsible for ensuring that coordinated and effective emergency response systems are developed and maintained. Existing government agencies will perform emergency activities closely related to those they perform routinely. Specific positions and agencies are responsible for fulfilling their obligations as presented in this EOP and individual annexes. As the IC, the Police Chief and/or Fire Chief (or designee) will provide overall direction of response activities for allCity departments. In accordance with State statute (ORS 401.305), the City Manager (or designee) may take extraordinary measures in the interest of effective emergency management. Department heads will retain control over their employees and equipment unless directed otherwise by the City Manager (ordesignee). Each department or agency will be responsible for having its own SOPs to be followed during response operations.

Outside assistance, whether from other political jurisdictions or from organized volunteer groups, will be requested and used only as an adjunct to existing City services, and then only when the situation threatens to expand beyond the City's response capabilities.

## 5.2 Emergency Operations Center

Response activities will be coordinated from an EOC and will be activated upon notification of a possible or actual emergency. The EOC will track, manage, and allocate appropriate resources and personnel. During large-scale emergencies, the EOC will, in fact, become the seat of government for the duration of the crisis. The EOC will serve as a Multi-Agency Coordination System, if needed.

### 5.2.1 Emergency Operation Center Activation

During emergency operations and upon activation, the EOC staff will assemble and exercise Direction and Control, as outlined below.

- The EOC will be activated by the City Manager, Police Chief, or Fire Chief (or their designees). The IC will assume responsibility for all operations and direction and control of response functions.
- The IC will determine the level of staffing required and will alert the appropriate personnel, agencies, and organizations.
- Emergency operations will be conducted by City departments, augmented as required by trained reserves, volunteer groups, and forces supplied through mutual aid agreements. County, State, and Federal support will be requested if the situation dictates.
- Communications equipment in the EOC will be used to receive information, disseminate instructions, and coordinate emergency operations.
- The IC may establish an on-scene command post at the scene to maintain close contact and coordination with the EOC.
- Department heads and organization leaders are responsible for emergency functions assigned to their activities, as outlined in their respective annexes.
- The EOC will normally operate on a 24-hour basis, rotating on 12-hour shifts, or as needed.
- The IC will immediately notify the County Emergency Management office upon activation. Periodic updates will be issued as the situation requires.

### 5.2.2 Emergency Operations Center Location

The **primary location** for the City EOC is:

Sandy Police Department
39850 Pleasant Street, Sandy, OR 97055

If necessary, the **alternate location** for the City EOC is:

Fire Annex Building
17460 Bruns Avenue, Sandy, OR 97055

**Figure 5-1 Primary EOC Location**

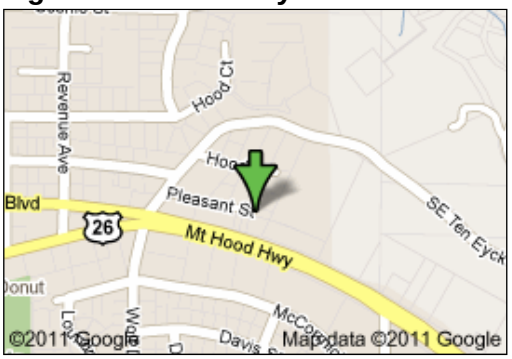
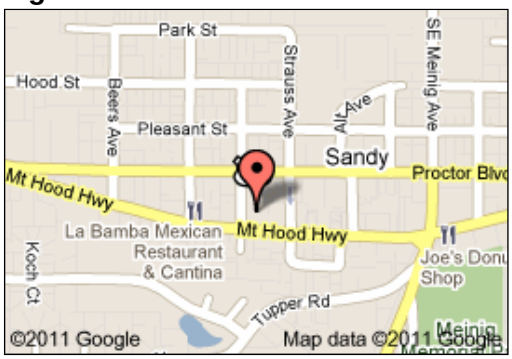


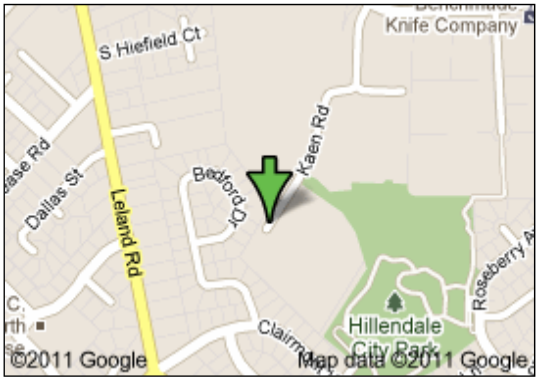

**Figure 5-2 Alternate EOC Location**




The **County EOC** is co-located with Clackamas County Emergency Management and CCOM offices at:

2200 Kaen Road
Oregon City, OR 97045

**Figure 5-3 County EOC Location**




*See FA 1 – Emergency Services for more detail.*

## 5.3 Incident Command System

In Oregon, implementation of NIMS and ICS is mandatory during an emergency incident. NIMS is a comprehensive, national approach to incident management, applicable to all jurisdictional levels and across functional disciplines. ICS is a standardized, flexible, scalable, all-hazard incident management system designed to be utilized from the time an incident occurs until the need for management and operations no longer exists. The system consists of practices for managing resources and activities during an emergency response and allows agencies to communicate using common terminology and operating procedures. It also allows for effective coordination and allocation of resources throughout an incident's duration.

The ICS structure can be expanded or contracted, dependingon the incident's changing conditions. It can be staffed and operated by qualifiedpersonnel from any emergency service agency and may involve personnel from avariety of disciplines. As such, the system can be utilized for any type or size of emergency, ranging from a minor incident involving a single unit to a major

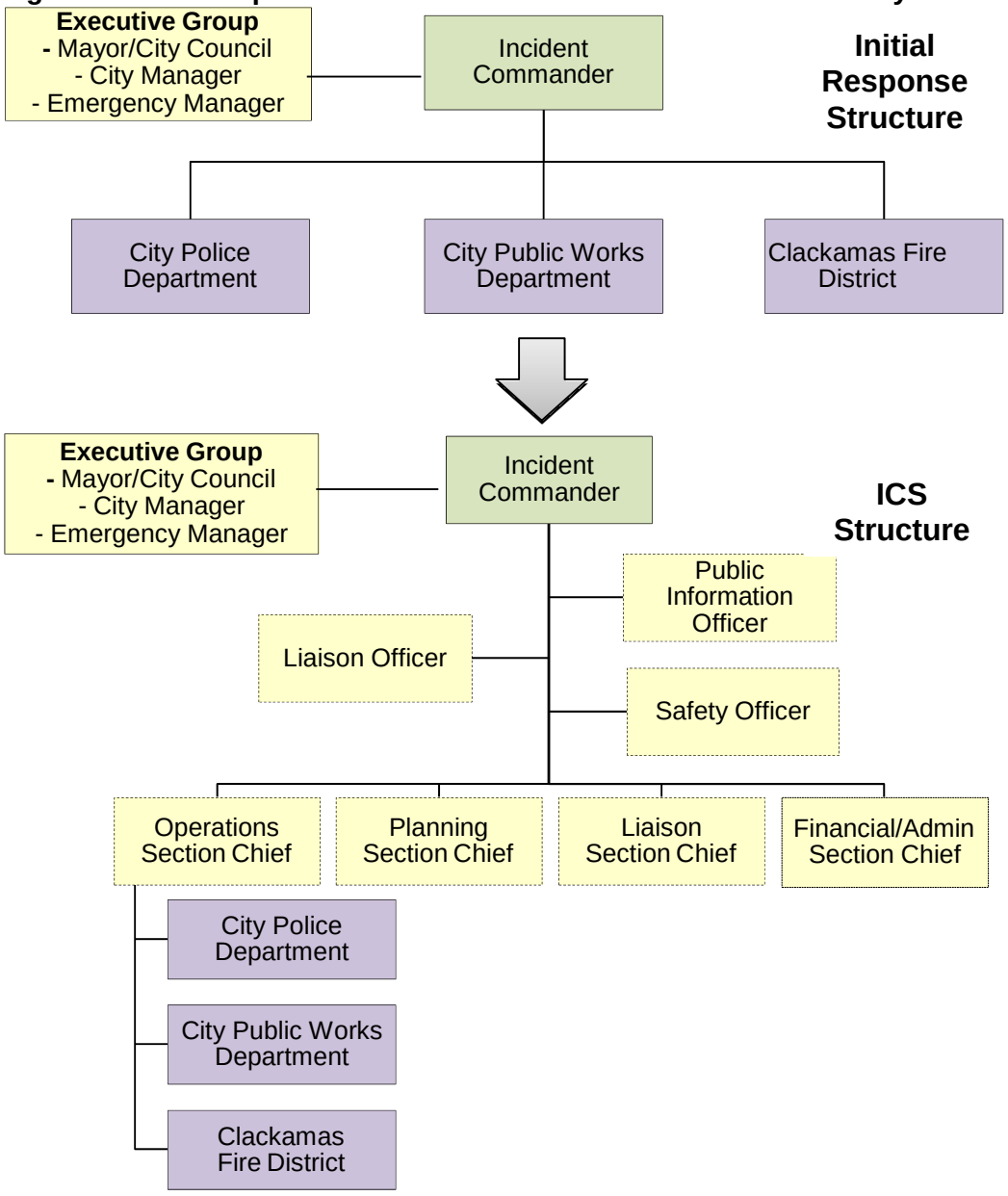
emergency involving several agencies and spanning numerous jurisdictions. The City has established an EMO, supporting EOC activation and operational procedures, and position checklists compliant with NIMS/ICS. This information is contained within this EOP; however, this document is not an EOC manual. A transitional ICS organizational chart for the City is presented in Figure 5-4.

The initial City response structure consists of the IC and single-resource agencies (i.e., the Public Works Department, Police Department, and Clackamas Fire District). Depending on the incident, the Public Works Director, Police Chief, or Fire Chiefmay act as both the IC and chief of their respective resource agencies. During theinitial response, an IC from the appropriate agency will be located at the on-sceneincident command post and will assume the responsibilities of the public information officer, liaison officer, and safety officer command staff responsibilities until these responsibilities are delegated.

As the incident progresses, and to maintain an adequate span of control, the initial response structure will expand into an ICS structure supported by full command and general staff positions. The City may activate the EOC and assign an IC. The City will require and request additional personnel to support this expanded structure. Depending on the incident type, the Public Works Department, Police Department, and Fire District will support the Operations Section Chief. Other City departments (e.g., City Administration) may support the expanded command or general staff roles as applicable. Following a declaration of emergency, the City may receive assistance from the County and may utilize and support the County ICS structure. At any time, if the incident expands or contracts, changes in jurisdiction or discipline, or becomes more or less complex, the IC may change to meet the needs of the incident.

Due to limited personnel and resources available in the City, it is imperative that all primary and alternate EOC staff be trained in ICS functions outside their areas of expertise. Regularly exercising ICS, including sub-functions and liaison roles, with volunteers and other support staff will improve overall EOC operation efficiency and add depth to existing City emergency management and response organizations.

**Figure 5-4 Example of a Scalable Command Structure for the City**




## 5.3.1 Emergency Operations Center Command Staff

### 5.3.1.1 Incident Commander

The IC is responsible for the operations of the EOC when it is activated and has overall responsibility for accomplishing the EOC mission. In general, the IC is responsible for:

- Approving and supporting implementation of an Incident Action Plan (IAP).
- Coordinating activities supporting the incident or event.

- Approving release of information through the PIO.
- Performing the duties of the following command staff if no one is assigned to the position:
  - Safety Officer
  - PIO
  - Liaison Officer
  - General Staff.

#### 5.3.1.2 Safety Officer

The Safety Officer is generally responsible for:

- Identifying initial hazards, determining personal protective equipment requirements, and defining decontamination areas.
- Implementing site control measures.
- Monitoring and assessing the health and safety of response personnel and support staff (including EOC staff).
- Preparing and implementing a site Health and Safety Plan and updating the IC regarding safety issues or concerns, as necessary.
- Exercising emergency authority to prevent or stop unsafe acts.

#### 5.3.1.3 Public Information Officer

A lead PIO will most likely coordinate and manage a larger public information network representing local, County, regional, and State agencies; tribal entities; political officials; and other emergency management stakeholders. The PIO's duties include:

- Developing and coordinating release of information to incident personnel, media, and the public.
- Coordinating information sharing among the public information network using a Joint Information System and, if applicable, establishing and staffing a Joint Information Center.
- Implementing information clearance processes with the IC.
- Conducting and/or managing media briefings and implementing media-monitoring activities.

#### 5.3.1.4 Liaison Officer

Specific liaison roles may be incorporated into the command structure established at the City and/or County EOC, depending on the type of emergency incident that has occurred. Liaisons represent entities and organizations such as hospitals, school districts, tribes, public works/utility companies, and volunteer services such as the American Red Cross. Responsibilities typically associated with a liaison role include:

- Serving as the contact point for local government officials, agency or tribal representatives, and stakeholders.
- Coordinating information and incident updates among interagency contacts, including the public information network.
- Providing resource status updates and limitations among personnel, capabilities, equipment, and facilities to the IC, government officials, and stakeholders.

The annexes attached to this plan contain general guidelines for the City governmental entities, organizations, and County officials and departments to carry out responsibilities assigned at the City EOC or other designated facility where response efforts will be coordinated.

### 5.3.2 Emergency Operations Center General Staff

#### 5.3.2.1 Operations Section Chief

The Operations Section Chief position is typically filled by the lead agency managing response activities for a specific type of incident. The Operations section is organized into functional units representing agencies involved in tactical operations. The following agencies are typically included in the Operations Section:

- Fire (emergencies dealing with fire, earthquake with rescue, or hazardous materials).
- Law Enforcement (incident(s) involving civil disorder/disturbance, significant security/public safety concerns, transportation-related accidents, and/or criminal investigations).
- Public Health Officials (contamination issues, disease outbreaks, and/or emergency incidents posing threats to human, animal, and environmental health).
- Public Works (incidents resulting in major utility disruptions, damage to critical infrastructure, and building collapse).

Private entities, companies, and NGOs may also support the Operations section. The Operations Chief is responsible for:

- Providing organizational support and directing implementation of unit operational plans and field response activities.
- Developing and coordinating tactical operations to carry out the IAP.
- Managing and coordinating various liaisons representing community response partners and stakeholders.
- Directing IAP tactical implementation.
- Requesting resources needed to support the IAP.

#### 5.3.2.2 Planning Section Chief

The Planning Section is responsible for forecasting future needs and events of the response effort while ensuring implementation of appropriate procedures and processes. This section is typically supported by four primary units: Resources, Situation, Documentation, and Demobilization. The Planning Chief is responsible for:

- Collecting, evaluating, and distributing information regarding the incident and providing a status summary.
- Preparing and disseminating the IAP.
- Conducting planning meetings and developing alternatives for tactical operations.
- Maintaining resource status.

#### 5.3.2.3 Logistics Section Chief

The Logistics Section is typically supported by the units responsible for Supply, Food, Communications, Medical, Facilities, and Ground Support. Depending on the incident's type and size, these units can be divided into two branches: Service and Support. The Logistics Chief is responsible for:

- Providing and managing resources to meet the needs of incident personnel.
- Managing various coordinators of resources, such as transportation-related equipment, EOC staff support services, supplies,facilities, and personnel.
- Estimating future support and resource requirements.
- Assisting with development and preparation of the IAP.

#### 5.3.2.4 Finance/Administration Section Chief

The Finance/Administration Section is specific to the incident type and severity of resulting impacts. In some instances, agencies may not require assistance, or only a specific function of the section may be needed that can be staffed by a technical specialist in the Planning section. Potential units assigned to this section include Compensation/Claims, Procurement, Cost, and Time. The Finance and Administration Chief is responsible for:

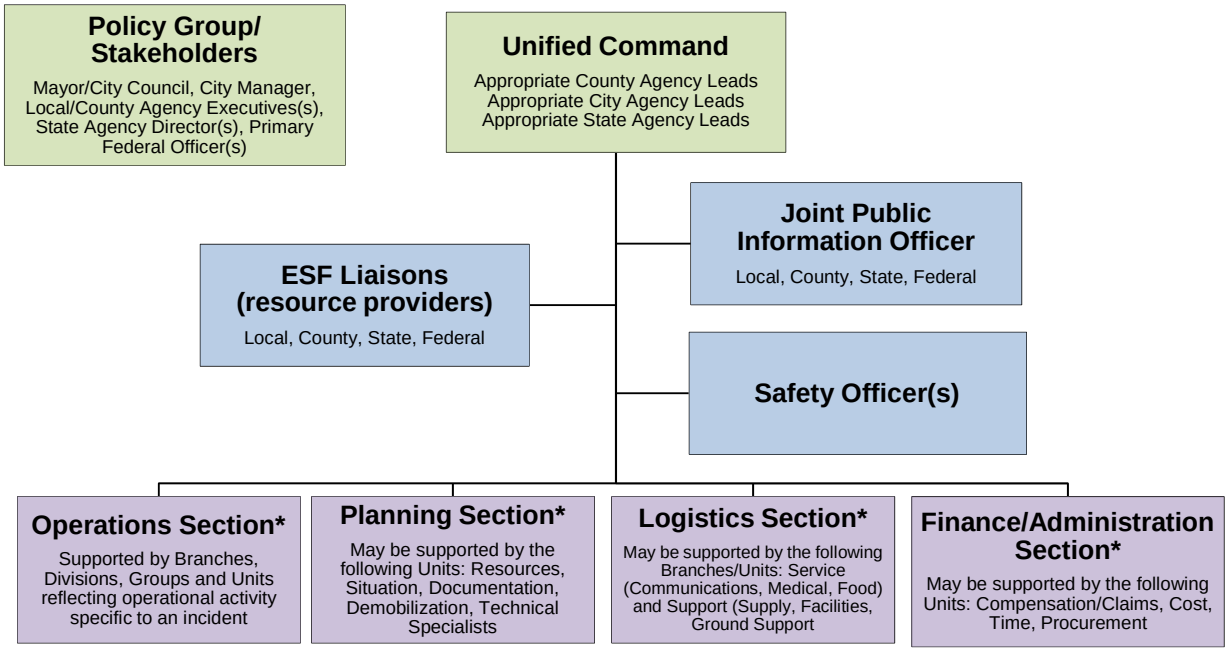
- Monitoring costs related to the incident.
- Maintaining accounting, procurement, and personnel time records.
- Conducting cost analyses.

## 5.4 Unified Command

In some incidents, several organizations may share response authority. ICS has the advantage of combining different local, County, regional, State, and Federal agencies into the same organizational system, maximizing coordination of response activities, and avoiding duplication of efforts. A structure called Unified Command (UC) allows the IC position to be shared among several agencies and organizations that maintain jurisdiction. UC members retain their original authority but work to resolve issues in a cooperative fashion to enable a more efficient response and recovery.

In a large incident involving multiple jurisdictions and/or regional, State, and Federal response partners, a UC may replace a single organization IC. Each of the four primary ICS sections may be further subdivided, as needed. In smaller situations, where additional persons are not required, the IC will directly manage all aspects of the incident organization. Figure 5-2 is an example of a UC organizational chart for the City. It provides operational flexibility to expand or contract staffing, depending on the incident's nature and size.

**Figure 5-5 Example of Unified Command for the City**




*Note: In any type of incident, a Section Chief may be assigned a Deputy. In addition, an Intelligence Section would be incorporated into the command structure in response to incidents of national significance or those presumed or confirmed to be terrorist related.

## 5.5 Multi-Agency Coordination

In the event the City is coordinating a response with other jurisdictions or agencies with authority over the incident it may choose to implement a Multi-Agency Coordination (MAC) Group. Typically, administrators/executives, or their appointed representatives, who are authorized to commit agency resources and funds are brought together and form MAC Groups. MAC Groups may also be known as a multiagency committees, emergency management committees, or as otherwise defined by the system. A MAC Group can provide coordinated decision making and resource allocation among cooperating agencies and may establish the priorities among incidents, harmonize agency policies, and provide strategic guidance and direction to support incident management activities.

# 6 Plan Development, Maintenance and Implementation

## 6.1 Plan Review and Maintenance

At a minimum, this EOP will be formally reviewed and re-promulgated every five years to comply with State requirements. This review will be coordinated by the City of Sandy City Manager or designee and will include participation by members from each of the departments assigned as lead agencies in this EOP and its supporting annexes. This review will:

- Verify contact information.
- Review the status of resources noted in the plan.
- Evaluate the procedures outlined in this plan to ensure their continued viability.

In addition, lead agencies will review the annexes and appendices assigned to their respective departments. A more frequent schedule for plan review and revision may be necessary.

**Recommended changes should be forwarded to:**

Tyler Deems, City Manager
39250 Pioneer Blvd.
Sandy, OR 97055
tdeems@ci.sandy.or.us

## 6.2 Training Program

The City Emergency Manager (or designee) specifically coordinates training for City personnel and encourages them to participate in trainings hosted by other jurisdictions throughout the region.

Current training and operational requirements set forth under NIMS have been adopted and implemented by the City. The Emergency Manager (or designee) maintains records and lists of training received by City personnel. Training requirements apply to all first responders and disaster workers, including first-line supervisors, middle management, and command and general staff. NIMS identifies these positions as follows:

- EMS personnel
- Firefighters
- Law enforcement personnel
- Public works/utility personnel
- Skilled support personnel
- Other emergency management response personnel
- Support/volunteer personnel at all levels.

Table 6-1 provides the minimum training requirements for the City's emergency personnel.

**Table 6-1 Minimum Training Requirements**

| Emergency Personnel | Training Required |
|---|---|
| Emergency Managers and Incident Commanders | ICS-100, -200, -300, -400<br>IS-700, -701, -703, -704, -800 |
| Other Command Staff, Section Chiefs, and Deputy Section Chiefs | ICS-100, -200, -300<br>IS-700, -701, -703, -704 (-702 for PIOs) |
| All other EOC personnel and first responders | ICS-100, -200<br>IS-700, -701, -703, -704 |
| All other emergency response personnel, including volunteers | ICS-100<br>IS-700 |
| *Independent study courses can be found at http://training.fema.gov/IS/crslist.asp.* | |

## 6.3 Exercise Program

The City will conduct exercises twice a year to test and evaluate this EOP. Whenever feasible, the City will coordinate with neighboring jurisdictions and State and Federal government to participate in joint exercises. These exercises will consist of a variety of tabletop exercises, drills, functional exercises, and full-scale exercises.

As appropriate, the City will use Homeland Security Exercise and Evaluation Program (HSEEP) procedures and tools to develop, conduct, and evaluate these exercises. Information about this program can be found at https://www.fema.gov/emergency-managers/national-preparedness/exercises/hseep

The Emergency Manager will work with other City/County departments and agencies to identify and implement corrective actions and mitigation measures, based on exercises conducted through Emergency Management.

## 6.4 Event Critique and After-Action Reporting

To document and track lessons learned from exercises, the Emergency Manager will conduct a review, or "hot wash," with exercise participants after each exercise. The Emergency Manager will also coordinate an After-Action Report, which will describe the objectives of the exercise and document the results of the evaluation.

Similarly, reviews and After-Action Reports will be facilitated after an actual disaster that will document activities of the incident to improve the City's readiness.

## 6.5 Community Outreach and Preparedness Education

Educational tools are used to teach the public about threats, disasters, and what to do when an emergency occurs. The City recognizes that citizen preparedness and education are vital components of overall readiness.

Information about the City's public education programs, hazard and mitigation information, and other emergency management and emergency services can be found at https://www.ci.sandy.or.us

## 6.6 Funding and Sustainment

It is a priority of the City to fund and maintain an emergency management organization that ensures the City's ability to respond to and recover from disasters. The Emergency Program Coordinator will work with City Council and community stakeholders to:

- Identify funding sources for emergency management programs, personnel, and equipment.
- Ensure that the City Council is informed of progress toward building emergency response and recovery capabilities and is aware of gaps to be addressed.
- Leverage partnerships with local, regional, and state partners to maximize use of scarce resources.

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# A Sample Disaster Declaration Forms

## Appendix A. Declaration of State of Emergency

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# DECLARATION OF STATE OF EMERGENCY

To: _____,
Clackamas County Office of Emergency Management

From:_____,
City of Sandy, Oregon

At_____(time) on_____(date),

a/an _____ (Description

of emergency incident or event type) occurred in the City of Sandy threatening life and property.

The current situation and conditions are:

_____

_____

_____

The geographic boundaries of the emergency are:

_____

_____

WE DO HEREBY DECLARE THAT A STATE OF EMERGENCY NOW EXISTS IN THE CITY OF SANDY AND THAT THE CITY HAS EXPENDED OR WILL SHORTLY EXPEND ITS NECESSARY AND AVAILABLE RESOURCES. WE RESPECTFULLY REQUEST THAT THE COUNTY PROVIDE ASSISTANCE, CONSIDER THE CITY AN "EMERGENCY AREA" AS PROVIDED FOR IN ORS 401, AND, AS APPROPRIATE, REQUEST SUPPORT FROM STATE AGENCIES AND/OR THE FEDERAL GOVERNMENT.

Signed: _____

Title:_____ Date & Time: _____

*This request may be passed to the County via radio, telephone, or FAX. The original signed document must be sent to the County Emergency Management Office, with a copy placed in the final incident package.*

# INSTRUCTIONS FOR COMPLETING THE DISASTER DECLARATION FORM:

**RESPONSIBILITY:** Completion of the Disaster Declaration Form is the responsibility of the Lead Agency or of the Incident Commander.

**TIMELINE:** As soon as possible after the initial assessment is made; or when it becomes apparent that the provisions of the City Emergency Code are necessary, or when assistance beyond that of mutual aid is necessary.

**DISTRIBUTION:** Command and General staff, City Manager, Mayor and City Council, Clackamas County Emergency Management, Oregon Emergency Management. This request may be passed to Clackamas County via radio, telephone, teletype, or fax. Hard copies must be sent to the Clackamas County Emergency Management and Oregon Emergency Management and a copy placed in the final incident package.

| | |
|---|---|
| **Clackamas County Emergency Management** | *503-655-8224/503-655-8531 (fax) |
| **Oregon Emergency Management** | 503-378-2911/503-588-1378 (fax) |

**SPECIAL INSTRUCTIONS:**

**FROM:** Personnel of the City of Sandy who may sign this declaration include the Mayor (or designee), City Manager (or designee), and Incident Commander. If time is not critical, the Council should meet to ratify the declaration. If time is of the essence, any of the above personnel may proceed with the declaration, with ratification occurring as soon as possible.

**"Current situation and conditions"** should include the rationale supporting the declaration of disaster, including (as appropriate), the need for additional powers to protect the public, the status of City response, commitment of City and mutual aid resources, and projection of incident potential.

**"Geographic Boundaries"** should be specific unless the entire City is impacted.

**"Forms of Assistance"** requests should be specific, including numbers, special qualifications, and tasks to be assigned. For example, if the National Guard is requested, describe tasks for which its resources will be used.

*The Clackamas County EOC may provide other numbers during emergency activation.

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# B Incident Command System Forms

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# Index of Incident Command System (ICS) Forms

The following ICS forms are included in this appendix.

| ICS Form No. | Form Title |
|---|---|
| ICS Form 201 | Incident Briefing |
| ICS Form 202 | Incident Objectives |
| ICS Form 203 | Organization Assignment List |
| ICS Form 204 | Assignment List |
| ICS Form 205 | Incident Radio Communications Plan |
| ICS Form 205a | Communications List |
| ICS Form 206 | Medical Plan |
| ICS Form 207 | Incident Organizational Chart |
| ICS Form 208 | Safety Message/Plan |
| ICS Form 209 | Incident Status Summary |
| ICS Form 210 | Resource Status Change |
| ICS Form 211 | Incident Check-in List |
| ICS Form 213 | General Message |
| ICS Form 214 | Activity Log |
| ICS Form 215 | Operational Planning Worksheet |
| ICS Form 215a | Incident Action Plan Safety Analysis |
| ICS Form 218 | Support Vehicle/Equipment Inventory |
| ICS Form 219 | Resource Status Card (T-Card) |
| ICS Form 220 | Air Operations Summary |
| ICS Form 221 | Demobilization Plan |
| ICS Form 225 | Incident Personnel Performance Rating |

All fillable forms accessible at https://www.nwcg.gov/publications/ics-forms

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# C Emergency Operations Center Position Checklists

## Appendix C. Emergency Operations Center Position Checklists

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# Index of EOC Position Checklists

The following checklists have been printed and are in the EOC.

1. Communication Unit Leader Checklist
2. Compensation/Claims Unit Leader Checklist
3. Cost Unit Leader Checklist
4. Demobilization Unit Leader Checklist
5. Documentation Unit Leader Checklist
6. Facilities Unit Leader Checklist
7. Finance – Administration Section Chief Checklist
8. Food Unit Leader Checklist
9. Ground Support Unit Leader Checklist
10. Incident Commander Checklist
11. Liaison Officer Checklist
12. Logistics Section Chief Checklist
13. Medical Unit Leader Checklist
14. Operations Branch Director Checklist
15. Operations Section Chief Checklist
16. Planning Section Chief Checklist
17. Procurement Unit Leader Checklist
18. Public Information Officer Checklist
19. Resources Unit Leader Checklist
20. Safety Officer Checklist
21. Service Branch Director Checklist
22. Situation Unit Leader Checklist
23. Staging Area Manager Checklist
24. Supply Unit Leader Checklist
25. Support Branch Director Checklist
26. Time Unit Leader Checklist

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# D Mutual Aid Agreements

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# Mutual Aid Agreements

The following is a quick reference list of mutual aid agreements entered into by the City.

- **Bomb Arson Tracking System Program**; Sandy Police Department and the Bureau of Alcohol, Tobacco, Firearms and Explosives, Unknown date. Allows for the use of an information system that will collect, analyze information related to explosives, arson, and the suspected criminal misuse of explosives.

- **Clackamas County Dispatch Center Member Board Charter**; Sandy Police Department and the Clackamas County Dispatch Center Board Member Charter, July 3, 2009. Establishes an executive Boar and Service Committees for the 911 dispatch center that dispatches the Sandy Police Department. This agreement provides an avenue for operational and budgetary development of services.

- **Clackamas County Interagency Amber Alert Agreement**; Sandy Police Department and the Clackamas County Interagency Amber Alert Team, December 16, 2002. Mutual agreement by all law enforcement agencies in Clackamas County providing for the development of internal policy, process, and training as related to missing children. It is also agreed that the Sandy Police Department will follow the Amber Alert criteria and process of the Amber Alert Program.

- **Interagency Investigative Agreement**; Sandy Police Department and the Interagency Major Crimes Team for Clackamas County, November 2, 2006. This agreement provides guidelines ad policies for the inter-agency investigation of major crimes committed in the venues of the participating agencies. When activated a team of investigators will respond to a criminal incident in Sandy. The team will the assist in the investigation. Our detective is a team member and may be called upon to assist other agencies with their criminal investigations.

- **Intergovernmental Agreement** between City of Sandy and Clackamas Fire District, June 11, 1996. The Clackamas Fire District will provide fireprotection services to both City and adjoining area.

- **Intergovernmental Agreement** between Sandy Police Department and CCOM forming the 800 Radio Group.

- **Intergovernmental Agreement** between Sandy Police Department and CCOM forming the 800 Radio Group. This agreement is pursuant to ORS 190.010 and 190.030.

- **Oregon Public Works Emergency Response Cooperative Assistance Agreement**; Oregon Department of Transportation and City of Sandy, February 28, 2010. Enables public works agencies to support each other during an emergency, provides the mechanism for immediate response to the requesting agency when the responding agency determines it can provide the needed resources and expertise, and sets up the documentation needed to seek maximum reimbursement possible from appropriate federal agencies.

# E References

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## Federal

- Public Law 93 234, as amended, Flood Disaster Protection Act of 1973.
- Public law 93-288, The Disaster Relief Act of 1974, as amended by Public Law 100-707, The Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988.
- The Code of Federal Regulations, Title 44, Part 206.
- Federal Emergency Management Agency, FEMA 64, Emergency Action Planning Guidelines for Dams, 1985.
- Federal Emergency Management Agency, Comprehensive Planning Guide 101, 2009.
- National Response Framework, 2008.
- National Incident Management System, 2008.
- Homeland Security Presidential Directive 5: Management of Domestic Incidents, 2003.

## State

- Oregon Emergency Management. State of Oregon Emergency Declaration Guidelines for Local Elected and Appointed Officials. March 2005.
- Oregon Revised Statutes (ORS) 401.305 through 401.335, 294.455 and 279B.080.
- Office of the State Fire Marshal. Oregon Fire Services Mobilization Plan. March 2010.

## County

- Clackamas County Emergency Operations Plan, 2017
- Memoranda of Agreement / Understanding

## Other

- City of Sandy Natural Hazard Mitigation Plan. 2010.
- City of Sandy Continuity of Operations Plan.

- City of Sandy Ordinance "Emergency Planning" Chapter 2.80.
- All other Public Laws or Executive Orders enacted or to be enacted which pertain to emergencies/disasters.

# F Acronyms and Glossary

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# Acronyms

| | |
|---|---|
| ADA | Americans with Disabilities Act |
| AMR | American Medical Response |
| BCC | Board of County Commissioners |
| CBRNE | Chemical, Biological, Radiological, Nuclear, Explosive |
| CCOM | Clackamas County Communications |
| CERT | Citizen Emergency Response Team |
| CFR | Code of Federal Regulations |
| City | City of Sandy (governing body) |
| COG | Continuity of Government |
| COOP | Continuity of Operations Plan |
| County | Clackamas County |
| DRC | Disaster Recovery Center |
| DSHS | Department of Social and Health Services |
| EAS | Emergency Alert System |
| ECC | Oregon Emergency Coordination Center |
| EMO | Emergency Management Organization |
| EMP | State of Oregon Emergency Management Plan |
| EMS | Emergency Medical Services |
| EOC | Emergency Operations Center |
| EOP | Emergency Operations Plan |
| ESF | Emergency Support Function |
| FA | Functional Annex |
| FBI | Federal Bureau of Investigations |
| FEMA | Federal Emergency Management Agency |
| HazMat | Hazardous Materials |
| IA | Incident Annex |
| IAP | Incident Action Plan |
| IC | Incident Commander |
| ICS | Incident Command System |
| JIC | Joint Information Center |

| | |
|---|---|
| LEDS | Law Enforcement Data System |
| MOU | Memorandum of Understanding |
| NERT | Neighborhood Emergency Response Team |
| NGO | Nongovernmental Organization |
| NHMP | Natural Hazards Mitigation Plan |
| NIMS | National Incident Management System |
| NOAA | National Oceanic and Atmospheric Administration |
| NRF | National Response Framework |
| NTSB | National Transportation Safety Board |
| ODOT | Oregon Department of Transportation |
| OEM | Oregon Emergency Management |
| OERS | Oregon Emergency Response System |
| OHAS-Wheels | Oregon Housing and Associated Services - Wheels |
| ORS | Oregon Revised Statutes |
| ORWARN | Oregon Water/Wastewater Agency Response Network |
| OSP | Oregon State Police |
| PAC | Public Assistance Coordinator |
| PDA | Preliminary Damage Assessment |
| PIO | Public Information Officer |
| RACES | Radio Amateur Civil Emergency Service |
| SA | Support Annex |
| SBA | Small Business Administration |
| SOP | Standard Operating Procedure |
| State | State of Oregon (governing body) |
| UC | Unified Command |
| USDA | United States Department of Agriculture |
| VA | Veterans Administration |
| WMD | Weapons of Mass Destruction |

# Glossary of Key Terms

**Actual Event:** A disaster (natural or man-made) that has warranted action to protect life, property, environment, public health, or safety. Natural disasters include earthquakes, hurricanes, tornadoes, floods, etc.; man-made (either intentional or accidental) incidents can include chemical spills, terrorist attacks, explosives, biological attacks, etc.

**After Action Report:** The After-Action Report documents the performance of exercise-related tasks and makes recommendations for improvements. The Improvement Plan outlines the actions that the exercising jurisdiction(s) plans to take to address recommendations contained in the After-Action Report.

**Agency**: A division of government with a specific function offering a particular kind of assistance. In ICS, agencies are defined either as jurisdictional (having statutory responsibility for incident management) or as assisting or cooperating (providing resources or other assistance).

**Agency Representative**: A person assigned by a primary, assisting, or cooperating State, local, or tribal government agency or private entity that has been delegated authority to make decisions affecting that agency's or organization's participation in incident management activities following appropriate consultation with the leadership of that agency.

**All Hazards:** Any incident caused by terrorism, natural disasters, or any CBRNE accident. Such incidents require a multi-jurisdictional and multi-functional response and recovery effort.

**Area Command (Unified Area Command)**: An organization established (1) to oversee the management of multiple incidents that are each being handled by an ICS organization or (2) to oversee the management of large or multiple incidents to which several Incident Management Teams have been assigned. Area Command has the responsibility to set overall strategy and priorities, allocate critical resources according to priorities, ensure that incidents are properly managed, and ensure that objectives are met, and strategies followed. Area Command becomes Unified Area Command when incidents are multi-jurisdictional. Area Command may be established at an emergency operations center facility or at some location other than an incident command post.

**Assessment**: The evaluation and interpretation of measurements and other information to provide a basis for decision making.

**Assignments**: Tasks given to resources to perform within a given operational period that are based on operational objectives defined in the IAP.

**Assistant**: Title for subordinates of principal Command Staff positions. The title indicates a level of technical capability, qualifications, and responsibility subordinate to the primary positions. Assistants may also be assigned to unit leaders.

**Assisting Agency**: An agency or organization providing personnel, services, or other resources to the agency with direct responsibility for incident management. See also Supporting Agency.

**Audit:** formal examination of an organizations or individual's accounts; a methodical examination and review.

**Available Resources**: Resources assigned to an incident, checked in, and available for a mission assignment, normally located in a Staging Area.

**Branch**: The organizational level having functional or geographical responsibility for major aspects of incident operations. A branch is organizationally situated between the section and the division or group in the Operations Section, and between the section and units in the Logistics Section. Branches are identified using Roman numerals or by functional area.

**Chain-of-Command**: A series of command, control, executive, or management positions in hierarchical order of authority.

**Check-In**: The process through which resources first report to an incident. Check-in locations include the incident command post, Resources Unit, incident base, camps, staging areas, or directly on the site.

**Chief**: The ICS title for individuals responsible for managing the following functional sections: Operations, Planning, Logistics, Finance/Administration, and Intelligence (if established as a separate section).

**Command**: The act of directing, ordering, or controlling by virtue of explicit statutory, regulatory, or delegated authority.

**Command Staff**: In an incident management organization, the Command Staff consists of the Incident Commander; the special staff positions of Public Information Officer, Safety Officer, Liaison Officer; and other positions as required, who report directly to the Incident Commander. They may have an assistant or assistants, as needed.

**Common Operating Picture**: A broad view of the overall situation as reflected by situation reports, aerial photography, and other information or intelligence.

**Communications Unit**: An organizational unit in the Logistics Section responsible for providing communication services at an incident or an EOC. A Communications Unit may also be a facility (e.g., a trailer or mobile van) used to support an Incident Communications Center.

**Cooperating Agency**: An agency supplying assistance other than direct operational or support functions or resources to the incident management effort.

**Coordinate**: To advance systematically an analysis and exchange of information among principals who have or may have a need-to-know certain information to carry out specific incident management responsibilities.

**Corrective Action**: Improved procedures that are based on lessons learned from actual incidents or from training and exercises.

**Corrective Action Plan**: A process implemented after incidents or exercises to assess, investigate, and identify and implement appropriate solutions to prevent repeating problems encountered.

**Critical Infrastructure**: Systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters. (Department of Homeland Security, National Response Plan (December 2004), 64.)

**Deputy**: A fully qualified individual who, in the absence of a superior, can be delegated the authority to manage a functional operation or perform a specific task. In some cases, a deputy can act as relief for a superior and, therefore, must be fully qualified in the position. Deputies can be assigned to the Incident Commander, General Staff, and Branch Directors.

**Dispatch**: The ordered movement of a resource or resources to an assigned operational mission or an administrative move from one location to another.

**Disciplines**: A group of personnel with similar job roles and responsibilities. (e.g., law enforcement, firefighting, HazMat, EMS).

**Division**: The partition of an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the manageable span of control of the Operations Chief. A division is located within the ICS organization between the branch and resources in the Operations Section.

**Emergency**: Absent a Presidential declared emergency, any incident(s), human-caused or natural, that requires responsive action to protect life or property. Under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, an emergency is any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.

**Emergency Management Assistance Compact**: The Emergency Management Assistance Compact is an interstate mutual aid agreement that allows states to assist one another in responding to all kinds of natural and man-made disasters. It is administered by the National Emergency Management Association.

**Emergency Operations Centers**: The physical location at which the coordination of information and resources to support domestic incident management activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction. EOCs may be organized by major functional disciplines (e.g., fire, law enforcement, and

medical services), by jurisdiction (e.g., Federal, State, regional, County, City, tribal), or some combination thereof.

**Emergency Operations Plan**: The "steady-state" plan maintained by various jurisdictional levels for responding to a wide variety of potential hazards.

**Emergency Public Information**: Information that is disseminated primarily in anticipation of an emergency or during an emergency. In addition to providing situational information to the public, it also frequently provides directive actions required to be taken by the public.

**Emergency Response Provider**: Includes state, local, and tribal emergency public safety, law enforcement, emergency response, emergency medical (including hospital emergency facilities), and related personnel, agencies, and authorities. See Section 2 (6), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002). Also known as Emergency Responder.

**Evacuation**: Organized, phased, and supervised withdrawal, dispersal, or removal of civilians from dangerous or potentially dangerous areas, and their reception and care in safe areas.

**Evaluation**: The process of observing and recording exercise activities, comparing the performance of the participants against the objectives, and identifying strengths and weaknesses.

**Event**: A planned, non-emergency activity. ICS can be used as the management system for a wide range of events, e.g., parades, concerts, or sporting events.

**Exercise**: Exercises are a planned and coordinated activity allowing homeland security and emergency management personnel (from first responders to senior officials) to demonstrate training, exercise plans, and practice prevention, protection, response, and recovery capabilities in a realistic but risk-free environment. Exercises are a valuable tool for assessing and improving performance, while demonstrating community resolve to prepare for major incidents.

**Federal**: Of or pertaining to the Federal Government of the United States of America.

**Federal Preparedness Funding**: Funding designated for developing and/or enhancing State, Territorial, local, and tribal preparedness capabilities. This includes all funding streams that directly or indirectly support Homeland Security initiatives, e.g. Center for Disease Control and Health Resources and Services Administration preparedness funds.

**Function**: Function refers to the five major activities in ICS: Command, Operations, Planning, Logistics, and Finance/Administration. The term "function" is also used when describing the activity involved, e.g., the planning

function. A sixth function, Intelligence, may be established, if required, to meet incident management needs.

**General Staff**: A group of incident management personnel organized according to function and reporting to the Incident Commander. The General Staff normally consists of the Operations Section Chief, Planning Section Chief, Logistics Section Chief, and Finance/Administration Section Chief.

**Group**: Established to divide the incident management structure into functional areas of operation. Groups are composed of resources assembled to perform a special function not necessarily within a single geographic division. Groups, when activated, are located between branches and resources in the Operations Section.

**Hazard**: Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.

**Homeland Security Exercise and Evaluation Program (HSEEP):** A capabilities- and performance-based exercise program that provides a standardized policy, methodology, and language for designing, developing, conducting, and evaluating all exercises. Homeland Security Exercise and Evaluation Program also facilitates the creation of self-sustaining, capabilities-based exercise programs by providing tools and resources such as guidance, training, technology, and direct support. For additional information please visit the Homeland Security Exercise and Evaluation Program toolkit at http://www.hseep.dhs.gov.

**Improvement Plan**: The After-Action Report documents the performance of exercise-related tasks and makes recommendations for improvements. The Improvement Plan outlines the actions that the exercising jurisdiction(s) plans to take to address recommendations contained in the After-Action Report.

**Incident**: An occurrence or event, naturally or human-caused, that requires an emergency response to protect life or property. Incidents can, for example, include major disasters, emergencies, terrorist attacks, terrorist threats, wildland and urban fires, floods, hazardous materials spills, nuclear accidents, aircraft accidents, earthquakes, hurricanes, tornadoes, tropical storms, war-related disasters, public health and medical emergencies, and other occurrences requiring an emergency response.

**Incident Action Plan**: An oral or written plan containing general objective reflecting the overall strategy for managing an incident. It may include the identification of operational resources and assignments. It may also include attachments that provide direction and important information for managing the incident during one or more operational periods.

**Incident Command Post**: The field location at which the primary tactical-level, on-scene incident command functions are performed. The ICP may be collocated

with the incident base or other incident facilities and is normally identified by a green rotating or flashing light.

**Incident Command System**: A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in the management of resources during incidents. It is used for all kinds of emergencies and is applicable to both small and large, complex incidents. ICS is used by various jurisdictions and functional agencies, both public and private, to organize field-level incident management operations.

**Incident Commander**: The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. The IC has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.

**Incident Management Team**: The IC and appropriate Command and General Staff personnel assigned to an incident.

**Incident Objectives**: Statements of guidance and direction necessary for selecting appropriate strategy(s) and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow strategic and tactical alternatives.

**Incident-Specific Hazards:** Anticipated events that may or may not occur that require coordinated response to protect life or property, e.g., pandemic flu, avian flu, etc.

**Initial Action**: The actions taken by those responders first to arrive at an incident site.

**Initial Response**: Resources initially committed to an incident.

**Intelligence Officer**: The intelligence officer is responsible for managing internal information, intelligence, and operational security requirements supporting incident management activities. These may include information security and operational security activities, as well as the complex task of ensuring that sensitive information of all types (e.g., classified information, law enforcement sensitive information, proprietary information, or export-controlled information) is handled in a way that not only safeguards the information but also ensures that it reaches those who need it to perform their missions effectively and safely.

**Interagency**: An organization or committee comprised of multiple agencies.

**Interoperability & Compatibility:** A principle of NIMS that holds that systems must be able to work together and should not interfere with one another if the multiple jurisdictions, organizations, and functions that come together under NIMS are to be effective in domestic incident management. Interoperability and compatibility are achieved using such tools as common communications and data standards, digital data formats, equipment standards, and design standards. (Department of Homeland Security, National Incident Management System (March 2004), 55.)

**Inventory**: An itemized list of current assets such as a catalog of the property or estate, or a list of goods on hand.

**Joint Information Center**: A facility established to coordinate all incident-related public information activities. It is the central point of contact for all news media at the scene of the incident. Public information officials from all participating agencies should collocate at the Joint Information Center.

**Joint Information System**: Integrates incident information and public affairs into a cohesive organization designed to provide consistent, coordinated, timely information during crisis or incident operations. The mission of the JIS is to provide a structure and system for developing and delivering coordinated interagency messages; developing, recommending, and executing public information plans and strategies on behalf of the IC; advising the IC concerning public affairs issues that could affect a response effort; and controlling rumors and inaccurate information that could undermine public confidence in the emergency response effort.

**Jurisdiction**: A range or sphere of authority. Public agencies have jurisdiction at an incident related to their legal responsibilities and authority. Jurisdictional authority at an incident can be political or geographical (e.g., City, County, tribal, State, or Federal boundary lines) or functional (e.g., law enforcement, public health).

**Lessons Learned**: Knowledge gained through operational experience (actual events or exercises) that improve performance of others in the same discipline. For additional information please visit https://www.llis.dhs.gov/

**Liaison**: A form of communication for establishing and maintaining mutual understanding and cooperation.

**Liaison Officer**: A member of the Command Staff responsible for coordinating with representatives from cooperating and assisting agencies.

**Local Government**: A County, municipality, City, town, township, local public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity,

or agency or instrumentality of a local government; an Indian tribe or authorized tribal organization, or in Alaska a Native village or Alaska Regional Native Corporation; a rural community, unincorporated town or village, or other public entity. See Section 2 (10), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

**Logistics**: Providing resources and other services to support incident management.

**Logistics Section:** The section responsible for providing facilities, services, and material support for the incident.

**Major Disaster**: As defined under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5122), a major disaster is:

> "any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of States, tribes, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."

**Management by Objective**: A management approach that involves a four-step process for achieving the incident goal. The Management by Objectives approach includes establishing overarching objectives; developing and issuing assignments, plans, procedures, and protocols; establishing specific, measurable objectives for various incident management functional activities and directing efforts to fulfill them, in support of defined strategic objectives; and documenting results to measure performance and facilitate corrective action.

**Mitigation**: The activities designed to reduce or eliminate risks to persons or property or to lessen the actual or potential effects or consequences of an incident. Mitigation measures may be implemented prior to, during, or after an incident. Mitigation measures are often informed by lessons learned from prior incidents. Mitigation involves ongoing actions to reduce exposure to, probability of, or potential loss from hazards. Measures may include zoning and building codes, floodplain buyouts, and analysis of hazard-related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury.

**Mobilization**: The process and procedures used by all organizations—state, local, and tribal—for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

**Multiagency Coordination Entity**: A multiagency coordination entity functions within a broader multiagency coordination system. It may establish the priorities among incidents and associated resource allocations, de-conflict agency policies, and provide strategic guidance and direction to support incident management activities.

**Multiagency Coordination Systems**: Multiagency coordination systems provide the architecture to support coordination for incident prioritization, critical resource allocation, communications systems integration, and information coordination. The components of multiagency coordination systems include facilities, equipment, emergency operation centers (EOCs), specific multiagency coordination entities, personnel, procedures, and communications. These systems assist agencies and organizations to fully integrate the subsystems of the NIMS.

**Multi-jurisdictional Incident**: An incident requiring action from multiple agencies that each have jurisdiction to manage certain aspects of an incident. In ICS, these incidents will be managed under Unified Command.

**Mutual-Aid Agreement**: Written agreement between agencies and/or jurisdictions that they will assist one another on request, by furnishing personnel, equipment, and/or expertise in a specified manner.

**National**: Of a nationwide character, including the State, local, and tribal aspects of governance and policy.

**National Disaster Medical System**: A cooperative, asset-sharing partnership between the Department of Health and Human Services, the Department of Veterans Affairs, the Department of Homeland Security, and the Department of Defense. National Disaster Medical System provides resources for meeting the continuity of care and behavioral health services requirements of the ESF 8 in the National Response Framework.

**National Incident Management System**: A system mandated by HSPD-5 that provides a consistent nationwide approach for state, local, and tribal governments; the private-sector, and nongovernmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. To provide for interoperability and compatibility among State, local, and tribal capabilities, the NIMS includes a core set of concepts, principles, and terminology. HSPD-5 identifies these as the ICS; multiagency coordination systems; training; identification and management of resources (including systems for classifying types of resources); qualification and certification; and the collection, tracking, and reporting of incident information and incident resources.

**National Response Plan**: A plan mandated by HSPD-5 that integrates Federal domestic prevention, preparedness, response, and recovery plans into one all-discipline, all-hazards plan.

**National Response Framework**: A guide to how the United States conducts all-hazards incident management. It is built upon flexible, scalable, and adaptable coordinating structures to align key roles and responsibilities across the nation. It is intended to capture specific authorities and best practices for managing incidents that range from the serious but purely local, to large-scale terrorist attacks or catastrophic natural disasters. The National Response Framework replaces the former National Response Plan.

**Non-Governmental Organization**: An entity with an association that is based on interests of its members, individuals, or institutions and that is not created by a government, but may work cooperatively with government. Such organizations serve a public purpose, not a private benefit. Examples of Non-Governmental Organizations include faith-based charity organizations and the American Red Cross.

**No-Notice Events**: An occurrence or event, natural or human-caused, that requires an emergency response to protect life or property (i.e. terrorist attacks and threats, wildland and urban fires, floods, hazardous materials spills, nuclear accident, aircraft accident, earthquakes, hurricanes, tornadoes, public health and medical emergencies etc.)

**Operational Period**: The time scheduled for executing a given set of operation actions, as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not over 24 hours.

**Operations Section**: The section responsible for all tactical incident operations. In ICS, it normally includes subordinate branches, divisions, and/or groups.

**Personnel Accountability**: The ability to account for the location and welfare of incident personnel. It is accomplished when supervisors ensure that ICS principles and processes are functional and that personnel are working within established incident management guidelines.

**Plain Language**: Common terms and definitions that can be understood by individuals from all responder disciplines. The intent of plain language is to ensure the clear and accurate communication of information during an incident. For additional information, refer to http://www.fema.gov/pdf/emergency/nims/plain_lang.pdf .

**Planning**: A method to developing objectives to be accomplished and incorporated into an EOP.

**Planning Meeting**: A meeting held as needed prior to and throughout the duration of an incident to select specific strategies and tactics for incident control operations and for service and support planning. For larger incidents, the planning meeting is a major element in the development of the IAP.

**Planning Section**: Responsible for the collection, evaluation, and dissemination of operational information related to the incident, and for the preparation and

documentation of the IAP. This section also maintains information on the current and forecasted situation and on the status of resources assigned to the incident.

**Preparedness**: The range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents. Preparedness is a continuous process. Preparedness involves efforts at all levels of government and between government and private-sector and nongovernmental organizations to identify threats, determine vulnerabilities, and identify required resources. Within NIMS, preparedness is operationally focused on establishing guidelines, protocols, and standards for planning, training and exercises, personnel qualification and certification, equipment certification, and publication management.

**Preparedness Organizations**: The groups that provide interagency coordination for domestic incident management activities in a non-emergency context. Preparedness organizations can include all agencies with a role in incident management, for prevention, preparedness, response, or recovery activities. They represent a wide variety of committees, planning groups, and other organizations that meet and coordinate to ensure the proper level of planning, training, equipping, and other preparedness requirements within a jurisdiction or area.

**Preplanned Event**: A preplanned event is a non-emergency activity. ICS can be used as the management system for events such as parades, concerts, or sporting events, etc.

**Prevention**: Actions to avoid an incident or to intervene to stop an incident from occurring. Prevention involves actions to protect lives and property. It involves applying intelligence and other information to a range of activities that may include such countermeasures as deterrence operations; heightened inspections; improved surveillance and security operations; investigations to determine the full nature and source of the threat; public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and, as appropriate, specific law enforcement operations aimed at deterring, preempting, interdicting, or disrupting illegal activity and apprehending potential perpetrators and bringing them to justice.

**Private Sector**: Organizations and entities that are not part of any governmental structure. It includes for-profit and not-for-profit organizations, formal and informal structures, commerce and industry, and private voluntary organizations.

**Processes**: Systems of operations that incorporate standardized procedures, methodologies, and functions necessary to provide resources effectively and efficiently. These include resource typing, resource ordering and tracking, and coordination.

**Public Information Officer (PIO)**: A member of the Command Staff responsible for interfacing with the public and media or with other agencies with incident-related information requirements.

**Public Information Systems**: The processes, procedures, and systems for communicating timely and accurate information to the public during crisis or emergency situations.

**Publications Management**: The publications management subsystem includes materials development, publication control, publication supply, and distribution. The development and distribution of NIMS materials is managed through this subsystem. Consistent documentation is critical to success because it ensures that all responders are familiar with the documentation used in a particular incident regardless of the location or the responding agencies involved.

**Qualification and Certification**: This subsystem provides recommended qualification and certification standards for emergency responder and incident management personnel. It also allows the development of minimum standards for resources expected to have an interstate application. Standards typically include training, currency, experience, and physical and medical fitness.

**Reception Area**: This refers to a location separate from staging areas, where resources report in for processing and out-processing. Reception Areas provide accountability, security, situational awareness briefings, safety awareness, distribution of IAPs, supplies and equipment, feeding, and bed down.

**Recovery**: The development, coordination, and execution of service- and site-restoration plans; the reconstitution of government operations and services; individual, private-sector, nongovernmental, and public-assistance programs to provide housing and to promote restoration; long-term care and treatment of affected persons; additional measures for social, political, environmental, and economic restoration; evaluation of the incident to identify lessons learned; post-incident reporting; and development of initiatives to mitigate the effects of future incidents.

**Recovery Plan**: A plan developed by a state, local, or tribal jurisdiction with assistance from responding Federal agencies to restore the affected area.

**Resources**: Personnel and major items of equipment, supplies, and facilities available or potentially available for assignment to incident operations and for which status is maintained. Resources are described by kind and type and may be used in operational support or supervisory capacities at an incident or at an EOC.

**Resource Management**: Efficient incident management requires a system for identifying available resources at all jurisdictional levels to enable timely and unimpeded access to resources needed to prepare for, respond to, or recover from an incident. Resource management under NIMS includes mutual aid agreements; the use of special state, local, and tribal teams; and resource mobilization protocols.

**Resource Typing**: Resource typing is the categorization of resources that are commonly exchanged through mutual aid during disasters. Resource typing definitions help define resource capabilities for ease of ordering and mobilization

during a disaster. For additional information, please visit https://rtlt.preptoolkit.fema.gov/Public

**Resource Typing Standard**: Categorization and description of response resources that are commonly exchanged in disasters through mutual aid agreements. The FEMA/NIMS Integration Center Resource typing definitions provide emergency responders with the information and terminology they need to request and receive the appropriate resources during an emergency or disaster.

**Resources Unit**: Functional unit within the Planning Section responsible for recording the status of resources committed to the incident. This unit also evaluates resources currently committed to the incident, the effects additional responding resources will have on the incident, and anticipated resource needs.

**Response**: Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes. As indicated by the situation, response activities include applying intelligence and other information to lessen the effects or consequences of an incident; increased security operations; continuing investigations into nature and source of the threat; ongoing public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and specific law enforcement operations aimed at preempting, interdicting, or disrupting illegal activity, and apprehending actual perpetrators and bringing them to justice.

**Safety Officer**: A member of the Command Staff responsible for monitoring and assessing safety hazards or unsafe situations and for developing measures for ensuring personnel safety.

**Scalability**: The ability of incident managers to adapt to incidents by either expanding or reducing the resources necessary to adequately manage the incident, including the ability to incorporate multiple jurisdictions and multiple responder disciplines.

**Section**: The organizational level having responsibility for a major functional area of incident management, e.g., Operations, Planning, Logistics, Finance/Administration, and Intelligence (if established). The section is organizationally situated between the branch and the Incident Command.

**Span of Control**: The number of individuals a supervisor is responsible for, usually expressed as the ratio of supervisors to individuals. (Under NIMS, an appropriate span of control is between 1:3 and 1:7.)

**Staging Area**: Location established where resources can be placed while awaiting a tactical assignment. The Operations Section manages Staging Areas.

**Standard Operating Procedures**: A complete reference document that details the procedures for performing a single function or a number of independent functions.

**Standardization**: A principle of NIMS that provides a set of standardized organizational structures (such as the ICS, multi-agency coordination systems, and public information systems) as well as requirements for processes, procedures, and systems designed to improve interoperability among jurisdictions and disciplines in various area, including: training; resource management; personnel qualification and certification; equipment certification; communications and information management; technology support; and continuous system improvement. (Department of Homeland Security, National Incident Management System (March 2004), 2.)

**State**: When capitalized, refers to the governing body of Oregon.

**Strategic**: Strategic elements of incident management are characterized by continuous long-term, high-level planning by organizations headed by elected or other senior officials. These elements involve the adoption of long-range goals and objectives, the setting of priorities; the establishment of budgets and other fiscal decisions, policy development, and the application of measures of performance or effectiveness.

**Strategy**: The general direction selected to accomplish incident objectives set by the IC.

**Strike Team**: A set number of resources of the same kind and type that have an established minimum number of personnel.

**Supporting Technologies**: Any technology that may be used to support the NIMS is included in this subsystem. These technologies include orthophoto mapping, remote automatic weather stations, infrared technology, and communications, among various others.

**Task Force**: Any combination of resources assembled to support a specific mission or operational need. All resource elements within a Task Force must have common communications and a designated leader.

**Technical Assistance**: Support provided to state, local, and tribal jurisdictions when they have the resources but lack the complete knowledge and skills needed to perform a required activity (such as mobile home park design and hazardous material assessments).

**Terrorism**: Under the Homeland Security Act of 2002, terrorism is defined as activity that involves an act dangerous to human life or potentially destructive of critical infrastructure or key resources and is a violation of the criminal laws of the United States or of any State or other subdivision of the United States in which it occurs and is intended to intimidate or coerce the civilian population or influence a government or affect the conduct of a government by mass

destruction, assassination, or kidnapping. See Section 2 (15), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

**Threat**: An indication of possible violence, harm, or danger.

**Tools**: Those instruments and capabilities that allow for the professional performance of tasks, such as information systems, agreements, doctrine, capabilities, and legislative authorities.

**Training**: Specialized instruction and practice to improve performance and lead to enhanced emergency management capabilities.

**Tribal**: Any Indian tribe, band, nation, or other organized group or community, including any Alaskan Native Village as defined in or established pursuant to the Alaskan Native Claims Settlement Act (85 stat. 688) [43 U.S.C.A. and 1601 et seq.], that is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

**Type**: A classification of resources in the ICS that refers to capability. Type 1 is generally considered to be more capable than Types 2, 3, or 4, respectively, because of size; power; capacity; or, in the case of incident management teams, experience and qualifications.

**Unified Area Command**: A Unified Area Command is established when incidents under an Area Command are multi-jurisdictional.

**Unified Command**: An application of ICS used when there is more than one agency with incident jurisdiction or when incidents cross political jurisdictions. Agencies work together through the designated members of the UC, often the senior person from agencies and/or disciplines participating in the UC, to establish a common set of objectives and strategies and a single IAP.

**Unit**: The organizational element having functional responsibility for a specific incident planning, logistics, or finance/administration activity.

**Unity of Command**: The concept by which each person within an organization reports to one and only one designated person. The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.

**Volunteer**: For purposes of NIMS, a volunteer is any individual accepted to perform services by the lead agency, which has authority to accept volunteer services, when the individual performs services without promise, expectation, or receipt of compensation for services performed. See, e.g., 16 U.S.C. 742f(c) and 29 CFR 553.101.

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# 1 FA 1 – Emergency Services

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| **Primary Agencies** | City Police Department<br>Clackamas Fire District<br>City Public Work Department |
| **Supporting Agencies** | Clackamas County Emergency Management<br>Clackamas County Health, Housing, and Human Services (H3)<br>Legacy Mount Hood Medical Center<br>American Medical Response (AMR)<br>9-1-1 Dispatch: Clackamas County Communications (CCOM)<br>Clackamas County Sheriff's Office (CCSO) |

# 1 Purpose and Scope

The Emergency Services annex outlines the basic City emergency services necessary to respond to a disaster.

Functions covered in the Emergency Services functional annex include:

- Emergency Communications
- Alert and Warning
- Firefighting
- Emergency Management (EOC Operations)
- Resource Management
- Search and Rescue
- Hazardous Materials Response
- Public Safety and Security
- External Affairs
- Evacuation and Population Protection

Emergency services information that is specific to a unique hazard (e.g., hazardous materials releases, terrorism, flood response, etc.) can be found in the appropriate Incident Annex (IA).

# 2 Policies and Agreements

The following policies and agreements are currently in place to support emergency services for the City:

- **Intergovernmental Agreement** between City of Sandy and Clackamas Fire District; The Clackamas Fire District will provide fireprotection services to both City and adjoining area.
- **Clackamas County Law Enforcement Intergovernmental Agreement;** Clackamas County Sheriff, Gladstone, West Linn, Molalla, Canby, Milwaukie, Sandy, Lake Oswego, and Oregon City (October 1991). The Sheriff, Chief of Police, or their representative is empowered to request assistance without advance notice from another or all other participating agencies when it appears that additional personnel, technology, and/or technical expertise is needed to respond to a major criminal incident, natural disaster, or extreme civil disorder occurring within the jurisdiction requesting assistance.
- **Critical Law Enforcement Intergovernmental Agreement;** Clackamas County, City of Canby, City of Gladstone, City of Milwaukie, City of Sandy, City of Lake Oswego, City of West Linn, City of Oregon City, City of Molalla (February 2004). This agreement makes equipment, personnel, and other resources available to public bodies when it reasonably appears that additional such resources are needed to respond to a major criminal incident, natural disaster, civil disorder, or special event occurring within the jurisdiction of the requesting entity.
- **Interagency Major Crimes Team Interagency Investigative Agreement;** Canby, Molalla, Clackamas County District Attorney, Oregon City, Clackamas County Sheriff's Office, Oregon State Police, Gladstone, Sandy, Lake Oswego, Tualatin, Milwaukie, and West Linn (November 2006). This agreement provides guidelines and policies for the inter-agency investigation of major crimes committed in the venues of participating agencies.
- **Oregon Terrorism Intelligence and Threat Assessment Network (TITAN) Fusion Center Information Sharing Memorandum of Understanding;** Oregon TITAN Fusion Center and Sandy Police Department. This agreement provides for the sharing of critical information to detect, prevent, deter, and respond to potential terrorist activity.

# 3 Situation and Assumptions

## 3.1 Situation

The City may encounter situations in which many, or all, of its emergency response agencies need to be activated. The three primary emergency service agencies are the City Police Department, City Public Works Department, and the Clackamas Fire District. If additional response resources are needed, mutual aid is available from neighboring local governments and the County.

## 3.2 Assumptions

- A natural or human-caused emergency or disaster may occur at any time requiring response capabilities beyond those normally available to the City.
- All emergency personnel are trained in the Incident Command System (ICS)/National Incident Management System (NIMS).
- Utilization of the City Emergency Operations Plan (EOP) does not require activation of the EOC. The need to activate the EOC will be determined at the time by the City Manager, Fire Chief, Police Chief or Emergency Manager.
- In an emergency, the City may assume a Unified Command (UC)approach, with the highest-ranking Police and Fire District representatives sharing the command responsibility.
- Due to limited City resources, and depending on how widespread the emergency, the City may not be able to meet the requests for emergency response/recovery assistance from other units of local government in the County during a major emergency.
- The City is responsible for coordinating the response and recovery activities for a major emergency/disaster in the city, even when its own resources may be exhausted.
- Adequate communications are vital for effective and efficient warning, response, and recovery operations. Current communications may be neutralized by a particular hazard occurrence.
- Equipment is available to provide communications necessary for emergency operations. To the greatest extent possible, telephones, cell phones, and pagers will be considered the primary system for notification of key officials and critical workers.
- Additional communications equipment required for emergency operations will be made available from amateur radio operators, citizens, businesses, and/or other governmental agencies.
- Both the media and the public will expect and demand that information regarding an emergency be provided in a timely manner.
- The local media, particularly radio and television, can perform an essential role in providing emergency instructions and status information to the public, both through news bulletins and Emergency Alert System (EAS) broadcasts.

- The public will receive and understand official information related to evacuation. Most of the public will act in its own interest and evacuate dangerous areas when advised to do so by local government authorities. However, some individuals may refuse to evacuate. It is also assumed that most evacuees will use private transportation means; however, transportation may have to be provided for some.

- City staff/emergency responders will work to address the concerns of special needs populations who may have trouble understanding or accessing official emergency information.

- Time constraints, route limitations, and hosting facilities' capacities to accommodate evacuees could significantly stress and deplete local resources.

- A listing of resources available for the City and neighboring jurisdictions can by found in the City Resource Directory housed at City Hall, the Police Station and the Fire Station.

- The timely and accurate assessment of damage to public or private property will be of vital concern to local officials following a disaster and will have great bearing upon the way recovery is conducted in the city.

- Damage assessments may need to be undertaken at different periods during a disaster event: a "windshield" survey may be conducted initially to get an overall general impression of the event's impact as part of preparing to issue the disaster declaration. A more detailed damage assessment will need to be performed to document the need for State and Federal aid.

- County, State, and Federal assistance will depend upon the adequate and timely documentation of the results of the disaster on the local community.

# 4 Roles and Responsibilities

The roles and responsibilities for each department in support of emergency services will vary depending on the type of resource, the length of the warning period, and the duration of the incident.

## 4.1 Emergency Manager/Incident Commander

- Activate the EOC, if necessary (EOC may also be activated by the City Manager, Police Chief and/or Fire Chief).
- Report to the EOC to assume overall responsibility for City government activities.
- Regularly brief the Mayor/City Council on the developing situation.
- Designate an alternative EOC location, if necessary.
- Assign a representative of the City to the County EOC, if applicable.
- Coordinate the flow of public information to ensure consistency and appropriateness.

## 4.2 Fire Chief

- Activate the EOC or Fire Operations Center (FOC), if necessary.
- Report to the EOC and/or provide a qualified representative to the EOC to fill role of Fire Branch Director in Operations Section.
- If necessary, provide for safety of personnel and their families prior to reporting to their duty station. Any firefighters who are unable toget to their home departments should report to the closest fire stations and offer to be part of the manpower pool.
- Relocate equipment as necessary.
- Assist law enforcement in traffic/crowd control as necessary.
- Coordinate activities through the City EOC.
- Specific departmental duties and responsibilities as defined in developed standard operating procedures (SOPs).

## 4.3 Police Chief

- Activate the EOC, if necessary.
- Report to the EOC.

- Provide for safety of personnel and their families prior to reporting to their duty station. Any police department employees who are unable to get to their home departments should report to the closest police department and offer to be part of the manpower pool.
- Relocate equipment as necessary.
- Assist in traffic/crowd control as necessary.
- Assume primary responsibility for closing and/or rerouting traffic on city streets to assist movement of people and/or to keep people out of danger or impeding emergency response activities.
- Coordinate and assist Oregon Department of Transportation (ODOT) and Oregon State Police (OSP) in closing state highway and/or rerouting traffic through the city, if applicable.
- Perform specific departmental duties and responsibilities as defined in developed standard operating procedures (SOPs).

## 4.4 Public Works Director

- Report to the EOC to assume overall responsibility for Public Works activities under the direction of the IC.
- Provide for safety of personnel and their families prior to reporting to their duty stations. Any public works employees who are unableto get to their home departments should report to the closest public works department and offer to be part of the staffing pool.
- Relocate equipment as necessary.
- Assist Police Department in closing streets and/or rerouting traffic, as applicable.
- Provide damage assessment information to City EOC, as applicable.
- Work with ODOT, the County, and adjacent City public works organizations to keep routes open and free of debris and to provide highway signs and barricades.
- Follow the specific departmental duties and responsibilities as defined in developed standard operating procedures (SOPs).

## 4.5 Community Development Director/Building Official

- Report to the EOC to assume to assume overall responsibility for planning activities.
- Planning Department duties and responsibilities include compiling, analyzing, and coordinating overall planning activities in support of

emergency operations.

- Building Official duties and responsibilities involving seismic events require the application of systematic "rapid evaluation" techniques for assessing the condition of key structures. The priority application for structure assessment is as follows:
  - EOC,
  - Public Works Staging Area,
  - Emergency Shelters, and
  - Other structures as directed by EOC.

### 4.6 Finance Director

- Report to the EOC and assume responsibility for all necessary fiscal activities.
- Financial Department duties and responsibilities include tracking, analyzing, approving, and reporting fiscal activities in support of emergency operations.

### 4.7 City Attorney

- Advise Command Staff, City Manager, and City Council on the legal Implications of evacuation activities.
- Assist as requested.

### 4.8 Other City Departments

- Provide support activities as outlined in the City EOP.

### 4.9 Other Organizations

- Organizations such as ODOT, OSP, AMR, and local hospitals should assign liaisons as points of contact within the City EOC for coordination and communication.

## 5 Concept of Operations

### 5.1 Emergency Management Organization

The City has established this EOP in accordance with NIMS and designated the City Manager as the Emergency Management Organization's Emergency Manager. The Emergency Manager is responsible for developing and training an Emergency Management Organization capable of managing the response and recovery of a major emergency in accordance with the provisions of this plan.

Oregon Revised Statutes (ORS) 401.305 and 401.335 give the City responsibility

and authority to direct activities that will allow the City to mitigate, prepare for, respond to, and recover from emergencies or major disasters. Activation of the EOP may occur at the discretion of the City Council or City Manager. Day-to-day supervision of the EOP is the responsibility of the Emergency Manager. If the EOC is activated, the Emergency Manager (or designee) has theresponsibility for organizing, supervising, and operating the EOC.

Some emergencies may require a self-triggered response. In the event of an emergency in which telephone service is interrupted, members of the Operations and General Staff should ensure the safety of their families and then report to the EOC.

The Emergency Manager has the authority to involve any or all City personnel in the response to a disaster or other emergency incident. The declaration of an emergency nullifies leaves and vacations as deemed necessary by the Mayor or City Council.

Emergency contact information for the EOC staff is housed in the City's Continuity of Operations Plan, the EOC, and the Finance Department of the City.

## 5.2 Emergency Operations Center

Response activities for localized incidents will be coordinated from a local EOC and will be activated upon notification of a possible or actual emergency. The EOC will track, manage, and allocate appropriate resources and personnel. During large-scale emergencies, the EOC will in fact become the seat of government for the duration of the crisis. The EOC will serve as a multiple agency coordination system (MACS), if needed.

### 5.2.1 Facilities and Equipment

The City's EOC is established at a location in which City officials can receive relevant information regarding the emergency and provide coordination and control of emergency operations.

The **primary location** for the City EOC is

Sandy Police Department
39850 Pleasant Street, Sandy, OR 97055

**Facilities available at the alternate EOC:** Backup generator, earthquake resistant design, laptops, 8,500 sq. ft. with approximately 500 sq. ft. of room for the EOC. Facility is prewired for additional workstations, phone lines, HAM operations and AM Radio operations.

If necessary, the **alternate location** for the City EOC is

Fire Annex Building
17460 Bruns Ave, Sandy, OR

**Facilities available at the primary EOC:** Backup generator, tables, chairs, televisions, computer.

The **County EOC** is co-located with Clackamas County Emergency Management at:

C-COM
2200 Kaen Road, Oregon City, OR 97045

However, the location of the EOC can change, as dictated by the nature of the disaster and the resource requirements needed to adequately respond. Coordination and control for City emergency operations will take place from the EOC as long as environmental and incident conditions allow; however, the Emergency Manager will designate a facility should it be necessary to relocate. The Emergency Manager (or designee) may request that County Emergency Management allow the City to utilize County facilities.

### 5.2.2 EOC Activation

The City Manager, Fire Chief and/or Police Chief or their designee have primary authority to initiate activation of the EOC.

As soon as practical, the Emergency Manager should notify County Emergency Management that the EOC has been activated. County Emergency Management should be briefed, and a preliminary determination made regarding the likelihoodof a disaster declaration.

### 5.2.3 EOC Activation Triggering Mechanism

The level of response required by an incident will provide guidelines for EOC activation.

**LEVEL I** Often referred to as "routine" crisis management or emergency situations, Level 1 situations can normally be handled using resources available at the incident location. It may not be necessary to implement an emergency plan for this level. Outside assistance is usually not required.

**LEVEL II** Level 2 situations are characterized by a need for response assistance from outside agencies (specialized equipment or personnel, insufficient or inadequate on-site resources, etc.). The request often takes the form of a 911 call for police, fire, or medical assistance. Examples include hazardous materials spills and traffic incidents with multiple injuries. Portions of the City EOP may be implemented.

**LEVEL III** Level 3 situations are major incidents that require application of a broad range of community resources to save lives and protect property. Examples include an airliner crash in a populated area, a major earthquake, etc. Emergency plans should be implemented, and the EOC will be activated to coordinate response and recovery activities.

### 5.2.4 Emergency Operations Center Access

Since the EOC is an operational center dealing with a large volume of incoming and outgoing, often sensitive, information, access shall be limited to designated emergency operations personnel. Others may be allowed access as determined by the IC (or designee). Appropriate security measures will be in place to identify personnel who are authorized to be present.

### 5.2.5 Emergency Operations Center Staffing Pattern

City departments and agencies involved in emergency response and personnel assigned to Command and General Staff (if previously designated) are required to report to the EOC upon activation. Personnel assigned to the EOC have the authority to make the decisions associated with their Command and General Staff position. Roles and Responsibilities for Command and General Staff are detailed in Section 5 of this EOP.

### 5.2.6 De-Activation Guidelines

Each situation will need to be evaluated to determine the need for continued operation of the EOC after the emergency response phase of the incident has been completed. The decision is made by the Incident Command and notification is sent to elected officials.

During the initial phase of the recovery period for a major disaster, it may be desirable to continue to operate the City EOC during the day with limited staffing to facilitate the dissemination of information on disaster relief programs available for the public and local government. This alternative should be weighed against the option of immediately requiring the City Manager and staff to handle the recovery phase as part of their daily responsibilities, which is the goal.

The City Manager has the final approval authority for activation and closureof the EOC. Once the decision has been made to limit hours/staff or close the EOC, the information needs to be disseminated to the same agencies that were notified when it was activated.

# 6 Emergency Services Functions

## 6.1 Communications

### 6.1.1 Emergency Communications Systems

Emergency communication systems for the City include AM 1660 Sandy Community Radio, police and fire public address systems, door to door contact, 911 email/text alerting (Reverse 911), social media, and HAM radios.

The Police Department serves as the formal alert, warning, and emergency message distribution point for the City. Emergency messages may be received via radio, telephone, or LEDS and will be distributed according to departmental procedures. Messages that affect the overall emergency preparedness of the City,

such as information about the movement of hazardous materials or weather alerts will be distributed to the Police Department and Emergency Manager. It is the responsibility of the Emergency Manager or IC, to determine what further notifications should be made and actions taken in response to the message.

After normal working hours, the Police Department will use the call-down lists housed at the front desk of the police department to contact responding department representatives (copies are also available with each supervisor, in BOLD Planning, and at CCOM). Once contact with the responding department's representative is made,it is the responsibility of that employee to determine and to activate the appropriate departmental response and further contacts that must be made.

### 6.1.2 Alert and Warning

The effectiveness of an alert and warning system depends largely upon the specificity and clarity of instructions and upon whether the public perceives the warning entity as credible at the time the warning is issued. In addition, messages must be geographically precise, repeated more than once, and broadcast in more than one medium.

The City's alert and warning system utilizes the local EAS, Reverse 9-1-1, police and fire vehicle public address systems, Sandy Community Radio, 9-1-1 email/text alerting, HAM radios, and door-to-door contact. Other local media (TV, radio, newspaper, etc.) may be utilized as appropriate. These methods may be used separately, or in combination to alert and warn the public of an emergency. In addition, special facilities such as schools, hospitals, utilities, and industrial facilities may need notification. Contact information for these facilities will be accessed online at the Police Station EOC.

#### 6.1.2.1 General Guidelines

- Upon detection of an emergency condition arising within the City, the IC will decide whether there is a need for immediate alert and shall attempt to notify the Emergency Manager and direct its implementation.

- The City may also receive warning information from the County by telephone, the OSP, Fire Net, and Oregon Emergency Management through the Law Enforcement Data System (LEDS). When warning information is received by telephone, the information should be confirmed by a return telephone call.

- If the emergency is localized, City law enforcement may alert residents in the area by telephone, mobile public address systems, and door-to-door contact.

- The City will educate residents about the City's alert and warning system.

- A log of warnings issued during the incident shall be maintained by the assigned Public Information Officer (PIO).

#### 6.1.2.2 Emergency Alert System

The National EAS consists of linked broadcast stations and to governmental communication systems to provide emergency alert and warning to the public. The City's primary public broadcast station have been identified as KQMD 554 (1660 AM), KXL (750 kHz AM) and KGON (92.3 MHz FM). All participating television and radio stations rebroadcast the information given to the primary stations.

Detailed instructions for the activation and use of the EAS are outlined in the Clackamas County EAS Plan. The County EAS Plan can be activated by the City Manager or the IC. Sample EAS messages can be found in Appendix B-1.

#### 6.1.2.3 Other Methods of Alert

Most marked police vehicles and most fire vehicles are equipped with mobile or hand-held public address systems which may be used for alert and warning.

Door to door alert may be necessary in the event of a rapidly emerging incident that poses a clear threat to public safety. Residents may be directed to temporary shelter depending upon the weather and the expected duration of the emergency.

Direction of these assets shall be the responsibility of the IC through the Law Enforcement Branch Director, with input and support from the Planning, Logistics, and Operations Sections.

*See the Clackamas County EOP, ESF 2 – Communications for more detail.*

## 6.2 Fire Services

The Fire District Chief is responsible for directing the City's fire protection response to a major emergency and coordinating response activities with the EOC.

The Fire District is responsible for the timely issuance of fire warnings and information to the public and for notifying appropriate City management. In the event of an evacuation, warning may be delegated to the Police Department as part of the evacuation process. In the event of a natural or technological disaster that could increase the chances of fire, or during periods of extremely hot, dry, andwindy weather, additional public information briefings may be conducted.

*See the Clackamas County EOP, ESF 4 – Firefighting for more detail.*

## 6.3 Resource Management

The EOC Staff has the authority under emergency conditions to establish priorities for the assignment and use of all resources. The City and Fire District may commit all its resources, if necessary, to protect life and property.

The Incident Command function has the overall responsibility for establishing resource priorities. In a situation where resource allocations are in dispute, the Incident Command has the final allocation authority. In the event of a long-term emergency affecting major City operations, the City department directors and the City Council may re-order City services and priorities to support the event. The Planning Section has primary responsibility for coordinating the resource management effort.

### 6.3.1 General Guidelines

Under emergency conditions, members of the EOC staff will allocate resources according to the following guidelines:

- Deploy resources according to the following priorities:
  Protection of life,
  Protection of responding resources,
  Protection of public facilities, and
  Protection of private property.

- Distribute resources in a manner that provides the most benefit for the number of local resources expended.

- Coordinate citizen appeals for assistance through the PIO at the EOC. Local media will be used to provide citizens with information about where to make these requests.

- Escalate the activation of other available resources by activating mutual aid agreements with other jurisdictions.

- Should the emergency be of such magnitude that all local resources are committed or expended, request assistance from the City for County, State, and Federal resources.

- Activation of County, State, and/or Federal resources will be accomplished in a timely manner through a State of Emergency Declaration and request for assistance from the County.

### 6.3.2 Emergency Fiscal Management

During an emergency, the City is likely to find it necessary to redirect City funds to effectively respond to the incident. Although the authority to adjust department budgets and funding priorities rests with the City Council, emergency procurement authority is delegated to the City Manager with the approval of the City Council. Participating agencies will also follow standard operating procedures when procuring goods and services. Tracking the expenditures related to an incident is the responsibility of the Finance Section.

If an incident in the City requires major redirection of City's fiscal resources, the following general procedures will be followed:

- The City Council will meet in emergency session to decide how to respond to the emergency funding needs.
- The City Council will declare a State of Emergency and request assistance through the County.
- If a quorum of Councilors cannot be reached, and if a prompt decision will protect lives, City resources and facilities, or private property, the City Manager (or designee) may act on emergency funding requests. The Mayor and City Council will be advised of such actions as soon as practical.
- To facilitate tracking of financial resources committed to the incident, and to provide the necessary documentation, a discrete charge code for all incident-related personnel time, losses, and purchases will be established by the Finance Section.

*See the Clackamas County EOP, ESF 7 – Logistics Management and Resource Support for more detail.*

## 6.4 Emergency Medical Services

Ambulance services in the City are provided by American Medical Response (AMR). Emergency Medical Services are also provided by the Clackamas Fire District.

*See the Clackamas County EOP, ESF 8 – Public Health and Medical Services for more detail.*

## 6.5 Search and Rescue

Search and Rescue for the City will be conducted by the Clackamas County Sheriff's Office.

*See the Clackamas County EOP, ESF 9 – Search and Rescue for more detail.*

## 6.6 Hazardous Materials Response

The Clackamas Fire District has a limited capacity to address a hazardous materials incident. Additional resources may be requested by the Fire District or IncidentCommand through the State Regional Hazardous Materials Teams.

*See the Clackamas County EOP, ESF 10 – Oil and Hazardous Materials for more detail.*

## 6.7 Law Enforcement Services

The Police Chief is responsible for directing the City's law enforcement response to a major emergency and coordinating response activities with the EOC. The Chief, or a designated representative, shall serve as the EOC Law Enforcement (Branch Chief) coordinating the flow of law enforcement information and processing requests for and allocating additional law enforcementresources, as appropriate.

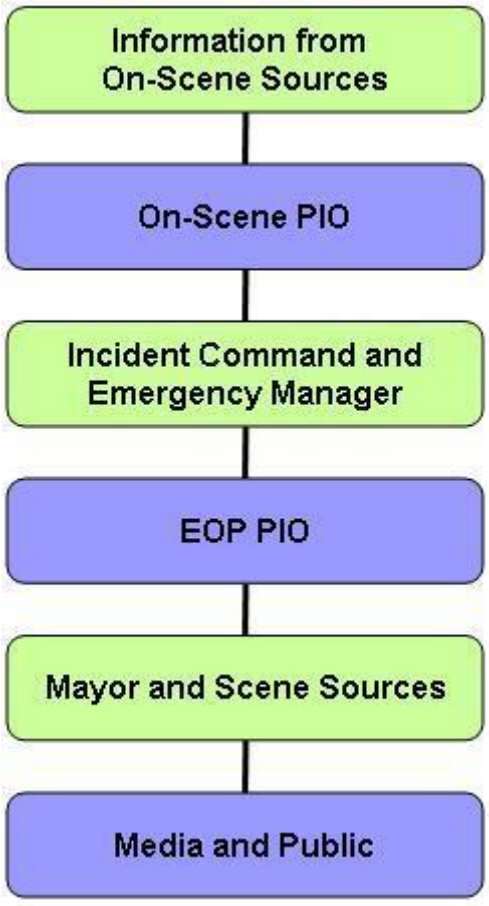
*See the Clackamas County EOP, ESF 13 – Public Safety and Security for more detail.*

## 6.8 Emergency Public Information

Until the EOC is opened, the PIO on scene provides information to the media, with the approval of the IC. Once the EOC is activated, PIO functions are directed from the EOC, with news releases approved by the IC. In addition to formal news releases from the EOC PIO, the on-scene PIO can continue to provide information regarding response activities.

### 6.8.1 Information Flow

Although the information process is fluid and must be able to respond to a variety of sources and requests for information the following flow of information should be followed,



Appendix B-2 of this annex contains guidelines for the release of information to the media.

### 6.8.2 Joint Information System

Providing timely and accurate public information during an emergency of any nature is critical to the overall response efforts. A joint information system will be implemented in conjunction with the ICS and a local and/or regional Joint Information Center (JIC) will be established under UC. The City will ensure that procedures are consistent with those implemented by the existing regional and state public information network.

Depending on the size and nature of the incident, the JIC may be co-located with an existing EOC/Command Post or could be designated as an independent facility. A lead PIO, representing the lead agency for the response, will be assigned to the incident and will maintain the following responsibilities:

- Coordinate information-sharing among the larger PIO network.
- Develop and distribute materials to the public and media partners.
- Implement information clearance processes set by the IC; and
- Schedule media briefings in a designated location away from the EOC and other emergency operations.

### 6.8.3 Media Briefing Facilities

During an emergency, media briefing areas may be established in the closest available facility that can handle the media briefings.

### 6.8.4 Media Access to the Scene

- In cooperation with the EOC and the Safety Officer, the IC may allow media representatives restricted access to the scene, accompanied by a member of the Public Information staff. This should be done with consideration of the safety of media personnel, the impact on response, and the wishes and concerns of the victims.
- If it is not safe or practical to admit all media representatives to the scene, a media “pool” may be created, in which media representatives select one camera crew to take video footage for all. If even such controlled access is impractical, a “staged” photo opportunity to tape response vehicles or support activities may satisfy the media’s need for video footage.

- Response personnel must be protected from unwanted media intrusion. Off-shift personnel should be provided uninterrupted rest. It may be necessary to provide security to facilities where response personnel are housed and disconnect the telephones to ensure privacy.

- Victims and families should have access to public officials without having to face media.

- The media may be allowed access to response personnel, at the discretion of the IC, only if such an interview does not interfere with the response effort.

- Response personnel will not comment on the incident without the consent of the IC. Inquiries should be directed to the designated PIO, with approval of the IC and the department of jurisdiction.

### 6.8.5 Public Assistance

The PIO may establish a "Public Assistance" group as part of the public information staff. Public Assistance staff will receive inquiries and requests for non-emergency assistance from the public. Public assistance telephonenumbers may be publicized through the media.

City communication points must receive up-to-date information about the incident, including the telephone numbers for public assistance, since the public will attempt to contact the City through these familiar routes.

*See the Clackamas County EOP, ESF 15 – External Affairs for more detail.*

## 6.9 Evacuation and Population Protection

The City Council, City Manager, or the Incident Commander (IC) may order an evacuation after consultation with the Incident Command. The City Council must approve and sign the evacuation order after considering both the legal and social implications of this action. If, however, for the health and safety of citizens, time does not permit access to the City Council, the City Manager or IC may order an evacuation and notify the City Council as soon as practical. *See Appendix C-1 of this annex, Sample Evacuation Order.*

Overall, evacuation operations fall under the direction of the City Police Department. However, if the evacuation area is contaminated by hazardous materials, the evacuation order will be given by the Clackamas Fire District. See Appendix C of this annex, Evacuation. Alert and warning functions notify affected persons of impending evacuations.

### 6.9.1 Identification of Need

Not all emergencies requiring protective action on the part of the public require evacuation. The City Council, City Manager and IC must weigh the risks of leaving the population unprotected against the risks of sheltering in place or evacuating. Before an evacuation can be implemented, the following activities must be performed:

- Identify high-hazard areas, including those that may be impacted if the incident escalates, or conditions change.
- Identify potential evacuation routes, their capacities, and their vulnerability to the hazard; and
- Alert and warn the public at risk. Include specific information about the risk, the protective actions that need to be taken, and the possible risks of non-compliance.

### 6.9.2 Determination of Time Needed for Evacuation

To determine evacuation time requirements, the following factors should be considered:

- Time from response to decision to evacuate.
- Time needed to alert and instruct the public, usually estimated to be from 15 to 60 minutes, depending upon the time of day and other factors.
- Time needed to mobilize the population once warned; under ideal circumstances, 2500 vehicles can pass a single point in one hour (estimate four persons per vehicle); and
- Time required to evacuate the hazard area.

### 6.9.3 Special Populations

Special populations within the City that may need assistance during evacuations include students and residents of nursing homes and hospitals. Correctional institutions and juvenile foster care are the responsibility of the County. All identified institutions are required to have internal disaster plans that address evacuation. In addition, the Logistics Section may assist in procuring specialized transportation resources such as ambulances and vehicles to transport the handicapped.

### 6.9.4 Shelter-in-Place

If sufficient time is not available to evacuate and/or the nature of the incident makes evacuation unsafe, Incident Command may choose to direct those in the affected area to shelter in place. Sheltering in place restricts affected people to their current locations. Other restrictions may also be necessary (see Appendix B-1 of this annex, EAS Templates).

# 7 Supporting Plans and Procedures

The following plans and procedures are currently in place to support emergency services for the City:

- County Emergency Operations Plan.
  - ESF 2 – Communications
  - ESF 4 – Firefighting
  - ESF 5 – Emergency Management
  - ESF 7 – Resource Management
  - ESF 9 – Search and Rescue
  - ESF 10 – Oil and Hazardous Materials
  - ESF 13 – Public Safety and Security
  - ESF 15 – External Affairs
- County Interoperable Communications Plan
- State of Oregon FireServices Mobilization Plan
- Northwest Contingency Plan

# 8 Appendices

- Appendix A EOC Operations
  - A-1 EOC Organizational Chart
  - A-2 EOC Floor Plan
  - A-3 Incident Briefing Agenda
- Appendix B Emergency Public Information Templates
  - B-1 EAS Templates
  - B-2 Guidelines for Release of Information to the Media
  - B-3 Sample Media Statement Format
- Appendix C Evacuation
  - C-1 Evacuation Order
  - C-2 Evacuation Routes
  - C-3 Evacuation Contact Form
  - C-4 Evacuation Checklist
  - C-5 Evacuation Traffic Policy

## Appendix A EOC Operations

A-1 EOC Organizational Chart

A-2 EOC Floor Plan

A-3 Incident Briefing Agenda

### Appendix A-1 EOC Organizational Chart

TO BE DEVELOPED

### Appendix A-2 EOC Floor Plan

TO BE DEVELOPED

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## Appendix A-3 Incident Briefing Agenda

Briefing Date and Time: _____

**SITUATION STATUS**

1. Initial Assessment of Incident
    a. Cause and extent of damage
    b. Forecasts (threat projection, cascading effects, HazMat footprint)
    c. Casualty estimates
    d. Helicopter/airplane/drone fly-over w/video
2. Assessment of damage (Initial Damage Assessment Reports - gathered by Plans/Intelligence Section)
    a. Government - county/cities
    b. Residential
    c. Business (downtown/shopping malls)
    d. Industrial
3. Critical infrastructure damage and restoration schedule
    a. Critical transportation routes (Highway 26, Highway 211, SE Bluff Road)
    b. Utilities (power, water, natural gas)
    c. Hospitals and mortuaries
    d. Prisons and jails
    e. Food and agriculture
4. Status of communications systems and restoration schedule
    a. 9-1-1 centers and interagency radio systems
    b. Telephones
    c. Commercial radio

**RESOURCE STATUS**

5. Outline EOC Management Structure Assignments (using the Incident Command System) for current shift and on-coming shift - include date/time of EOC activation and when shift changes occur
    a. Policy Group Liaison (Commissioner)
    b. Incident commander
    c. Command Staff
        1) Liaison (Intergovernmental)
        2) Public Information Officer
    d. General Staff
        1) Operations Section Chief
        2) Planning Section Chief
        3) Logistics Section Chief
        4) Finance Section Chief
6. Current public safety response, capability and need for assistance beyond mutual assistance:
    a. Transportation (emergency support)
    b. Communications
        1) 9-1-1 centers and interagency radio systems
        2) Telephones
        3) Commercial radio and television
    c. Public Works / Engineering (Public assets and private construction companies)
    d. Firefighting
    e. Intelligence and Planning
    f. Mass Care
    g. Service and Support
    h. Health and Medical Services
    i. Search and Rescue

j. Hazardous Materials (Public assets and private companies with HazMat teams)

k. Food and Water (delivery needs/resources)

1) American Red Cross

2) School cafeterias

3) Forest Service trucks - State and Federal contract

4) Jail cooking capability

5) Grocery stores and restaurants

6) For response workers

l. Energy

m. Public Safety

n. Damage Assessment

o. Evacuation

p. Shelters (needs and supply)

1) Number of established/locations

2) Number of people sheltered by location/total

3) Problems encountered

q. Volunteers

7. Insurance claims procedures and response - establishment of Disaster Recovery Centers

8. Need for Declaration of Emergency Disaster by City Council

a. National Guard Assistance

b. Financial assistance (County/State/Federal)

c. Other State agency resources (people or equipment not available through mutual aid agreements)

9. Critical contacts established

a. City Departments

b. County and other Cities

c. Oregon Emergency Management/FEMA

d. ODOT

e. Elected Officials (Governor, State and Federal Representatives and Senators, Mayors, Adjacent County Commissioners or City Council members, Board of Commissioners)

f. Media (local radio (WQMD 554 1660 AM, EAS Stations)

10. Documentation - videotaping, logs, photos, minutes and tapes of meetings

**Proposed 12-hour STRATEGIC RESPONSE PLAN**

11. Need for evacuation and action being taken by police, fire, public works and the EAS, provision for vandalism protection for evacuated areas

12. Summary

    a. Major actions to be taken and priorities established

    b. Establish timelines and responsibilities

    c. Schedule meetings for next 8–12 hours (EOC, Policy Group, Department)

    d. Schedule of news release and location (schedule for last one, next one)

13. Continuing Concerns

## Appendix B Emergency Public Information Materials

B-1 Local Emergency Alert System Procedures

B-2 Emergency Alert Systems (EAS) Templates

B-3 Guidelines for Release of Information to the Media

B-4 Sample Media Statement Format

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## Appendix B-1 Local Emergency Alert System Procedures

City of Sandy officials authorized to activate the area EAS plan include:

- Any Command officer acting as IC in an incident that, in his or her judgment, threatens public safety.

- Any member of the Command or General Staff at the direction of the IC. Delegation of this authority by the IC to another member of the incident staff must be documented in writing at the time of the order.

- The following personnel have authority to activate the EAS. However, this should not be done without the knowledge and concurrence of the IC:

  - City Manager
  - Police Chief
  - Clackamas Fire Chief

- Due to the 24-hour accessibility to emergency responders, CCOM will provide the authentication point for City implementation of this plan. In the event of a major disaster that involves the failure or the overloading of the telephone system, the EAS may be used to notify off-duty personnel to return to work. Should CCOM be unable to fulfill this function City Police Records will fulfill this and following functions.

- Upon notification that a City official intends to activate the EAS, CCOM will either supply that person with the phone number for KXL 750 AM/ KOON 92.3 FM or will perform the activation under the direction of the activating official.

- When the threat to public safety has passed, the activating official will advise CCOM to contact KXL 750 AM/KGON 92.3 FM and terminate emergency transmissions.

## Appendix B-2 EAS Templates

- Shelter In Place
- Prepare to Evacuate
- Evacuation
- Termination of Emergency Transmissions

**SHELTER IN PLACE:**

The Incident Command, City Manager, and Sandy City Council are urging citizens for the area_____ to take the following protective actions due to _____. We request that all persons in the affected area remain inside their houses or other closed building until their radio, television, or public safety officials say they can leave safely. If you are in the affected area, tum off heat, ventilation, and cooling systems and window or attic fans. Close all windows, doors, and vents and cover cracks with tape or wet rags. Keep pets and children inside. If you are inside and have trouble breathing, cover your mouth and nose with a damp cloth. If you are outside, cover your nose and mouth with a handkerchief or other cloth until you can reach a building. Failure to follow these instructions may result in exposure to hazardous materials. Please stay tuned to this station for further details.

**PREPARE TO EVACUATE:**

The City of Sandy responded to a potentially serious condition involving___. The incident is occurring at_____. The Incident Command, City Manager, and Sandy City Council request all persons in ____ to stay indoors and prepare to evacuate. If you are in your home, gather all necessary medications and clothing. You do not need to evacuate at this time but stay tuned to this station for further instructions. This message will be repeated at intervals until conditions change.

**EVACUATION:**

The City of Sandy is managing an emergency incident at___. A State of Emergency has been declared. The Incident Command, City Manager, and Sandy City Council are requesting the immediate evacuation of the area____due to____. Please take medications, and personal hygiene supplies with you and evacuate to by traveling_. Emergency personnel will pass along this route to direct you out of the area. Failure to evacuate may result in life endangerment. The American Red Cross is opening shelters for those affected by the evacuation at__. If you need help evacuating your home, please signal emergency workers by placing awhite cloth on your front door or calling the City at____-.

## TERMINATION OF EMERGENCY TRANSISSIONS

City of Sandy public safety officials have determined that the incident that occurred at ____ no longer represents a threat to public safety. All those who have been evacuated may now return home. Those who have been directed to take shelter in their homes may now leave. The City of Sandy thanks this station for its assistance, and those impacted for their cooperation and patience during this emergency incident.

## Appendix B-3 Guidelines for Release of Information to the Media

The following guidelines shall be used in evaluating and releasing information concerning the incident:

1. Accurate information will be provided to the media. Facts that can be confirmed should be released as soon as possible. If little information is available, the following statement should be issued:

   *"We are aware that an (incident/accident) involving (type of incident) occurred at approximately (time), in the vicinity of (general location). Emergency crews are responding, and we will have additional information available as we are able to confirm it. We will hold a briefing at (location) and will alert the media at least 1/2 hour prior to the briefing. At this time, the briefing is the only place where officials authorized to speak about the incident and confirmed information will be available. Thank you for your assistance."*

2. Emergency information dissemination should be restricted to approved, specific, and verified information concerning the incident, and should include:

   a. Nature and extent of emergency occurrence.

   b. Impacted or potentially affected areas of the City.

   c. Advice on emergency safety procedures, if any.

   d. Activities being conducted by the City to combat the hazardous conditions, or mitigate the effects; and

   e. Procedures for reporting emergency conditions to the EOC.

3. Information concerning the incident should be consistent for all members of the media. If the incident is being managed by a Unified Command, a unified approach to information management shall be used whenever possible. When working with private sector entities, public safety issues will be the responsibility of the public safety agencies; questions about corporate policies or processes will be referred to the private sector cooperator.

4. Information should be presented in an objective manner.

5. Rumor control is vital during emergency operations. Sensitive or critical information must be authorized and verified before release. Unconfirmed rumors or information from unauthorized sources may be responded to in the following manner:

   *"We will not confirm____until we have been able to check out the information through authorized sources. Once we have confirmed information, we will release it to all members of the press at the same time."*

6. Information that media representatives often request includes:
    a. Emergency: What is it?
    b. Location: Where is it?
    c. Time: When did it occur? How long will it last?
    d. Injuries/Casualties: Are there any? How Many? What is the nature of the injuries? Where are they being treated/stored? Care provided? Where can family memberscall to get information? Prominent individuals who were injured or killed?
    e. Property Damage: Estimated value? Description? Importance of property? Previous history of emergency calls there? Other property threatened?
    f. Causes: How discovered? Who summoned aid? How was aid summoned? Known causes?
    g. Involved agencies: What agencies responded? How many? What level of involvement do they have?
7. Do not release information that might hinder emergency response, prejudice the outcome of an investigation, or pose a further threat to public safety. Examples include:
    a. Personal conjecture about the course of the emergency or the conduct of response.
    b. Opinions about evidence, or a suspect or defendant's character, guilt, or innocence.
    c. Contents of statements used in alibis, admissions, or confessions.
    d. References to the results of various tests and examinations.
    e. Statements that might jeopardize the testimony of witnesses.
    f. Demeaning information/statements; and
    g. Information that might compromise the effectiveness of response and recovery.
8. In an incident involving fatalities, the names of the victims or the cause of death shall not be released without authorization from the District Attorney's and Medical Examiner's office.
9. Confidential information is not to be released.
10. Public information briefings, releases, interviews, and warnings shall be logged and tape-recorded. Copies shall become part of the final incident package. Never commit to firm briefing times unless it can be assured.

## Appendix B-4 Sample Media Statement Format

# MEDIA RELEASE

Date:_____

Time: _____

Press Release #: _____

**TYPE OF INCIDENT: _____**

Location: _____

Date:_____ Time: _____

Narrative details about incident: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

For further information, please contact _____

at_____.

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# Appendix C Evacuation

C-1 Evacuation Order

C-2 Evacuation Routes

C-3 Evacuation Checklist

C-4 Evacuation Traffic Policy

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## Appendix C-1 Evacuation Order

1. An emergency condition, as a result of_____, exists in the City of Sandy, and the City has declared a State of Emergency.
2. The City has determined that there is a need to evacuate portions of the City.
3. Such evacuation is needed to ensure the safety of the public. Therefore:

   _____

   _____
4. The City of Sandy is requesting the immediate evacuation of:

   _____

   _____
5. The City of Sandy requests that those needing special assistance call _____ or place a white flag, (towel, rag, paper, etc.) on the front doorknob or in the front window. The above number has been established to respond to evacuation assistance requests.
6. The City of Sandy is restricting all entry into the hazard area. No one will be allowed to re-enter the area after_____am/pm.
7. Information and instructions from the City of Sandy will be transmitted by broadcast radio. Public information will also be available from American Red Cross representatives at shelters now being opened to the public for emergency housing.
8. As resources allow, a reception area or American Red Cross shelter is located at:

   _____
9. The City of Sandy will advise the public of the lifting of this order when public safety is assured.

Date _____ Signed_____

Mayor/Council Member

Date _____ Signed_____

City Manager/IC

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## Appendix C-2 Evacuation Routes

TO BE DEVELOPED

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## Appendix C-3 Evacuation Checklist

| ✓ | Action Item | Assigned |
|---|---|---|
| | **PLANNING:** | |
| | 1. Determine area(s) at risk:<br>· Determine population of risk area(s)<br>· Identify any special facilities and functional needs populations in risk area(s) | |
| | 2. Determine evacuation routes for risk area(s) & check the status of these routes. | |
| | 3. Determine traffic control requirements for evacuation routes. | |
| | 4. Estimate public transportation requirements & determine pickup points. | |
| | 5. Determine temporary shelter requirements & select preferred shelter locations. | |
| | **ADVANCE WARNING:** | |
| | 6. Provide advance warning to special facilities & advise them to activate evacuation, transportation & reception arrangements. Determine if requirements exist for additional support from local government. | |
| | 7. Provide advance warning of possible need for evacuation to the public, clearly identifying areas at risk. | |
| | 8. Develop traffic control plans & stage traffic control devices at required locations | |
| | 9. Coordinate with special facilities regarding precautionary evacuation. Identify and alert functional needs populations. | |
| | 10. Ready temporary shelters selected for use. | |
| | 11. Coordinate with transportation providers to ensure vehicles & drivers will be available when and where needed. | |
| | 12. Coordinate with school districts regarding closure of schools. | |
| | 13. Advise neighboring jurisdictions that may be affected of evacuation plans. | |
| | **EVACUATION:** | |
| | 14. Advise neighboring jurisdictions that evacuation recommendation or order will be issued. | |
| | 15. Disseminate evacuation recommendation or order to special facilities and functional needs populations. Provide assistance in evacuating, if needed. | |
| | 16. Disseminate evacuation recommendation or order to the public through available warning systems, clearly identifying areas to be evacuated. | |

| ✓ | Action Item | Assigned |
|---|---|---|
| | 17. Provide amplifying information to the public through the media. Emergency public information should address:<br>· What should be done to secure buildings being evacuated<br>· What evacuees should take with them<br>· Where evacuees should go & how should they get there<br>· Provisions for functional needs population & those without transportation | |
| | 18. Staff and open temporary shelters | |
| | 19. Provide traffic control along evacuation routes & establish procedures for dealing with vehicle breakdowns on such routes. | |
| | 20. Provide transportation assistance to those who require it. | |
| | 21. Provide security in or control access to evacuated areas. | |
| | 22. Provide Situation Reports on evacuation to the County. | |
| | **RETURN OF EVACUEES** | |
| | 23. If evacuated areas have been damaged, reopen roads, eliminate significant health and safety hazards, & conduct damage assessments. | |
| | 24. Determine requirements for traffic control for return of evacuees. | |
| | 25. Determine requirements for & coordinate provision of transportation for return of evacuees. | |
| | 26. Advise neighboring jurisdictions that return of evacuees will begin. | |
| | 27. Advise evacuees through the media that they can return to their homes and businesses; indicate preferred travel routes. | |
| | 28. Provide traffic control for return of evacuees. | |
| | 29. Coordinate temporary housing for evacuees that are unable to return to their residences. | |
| | 30. Coordinate with special facilities regarding return of evacuees to those facilities. | |
| | 31. If evacuated areas have sustained damage, provide the public information that addresses:<br>· Documenting damage & making expedient repairs<br>· Caution in reactivating utilities & damaged appliances<br>· Cleanup & removal/disposal of debris<br>· Recovery programs | |
| | 32. Terminate temporary shelter & mass care operations. | |
| | 33. Maintain access controls for areas that cannot be safely reoccupied. | |

## Appendix C-4 Evacuation Traffic Policy

In the event of an evacuation in the City of Sandy:

1. All City employees not directly involved in the incident shall be available for traffic control and direction.

2. The City has the authority to close local roads and to restrict access to and from all areas of the city.

3. Roads under the jurisdiction of the Oregon Department of Transportation (ODOT) (Highways 26 and 211) would be authorized for closure by the ODOT District Manager, or in the case of a crime or fire, the authority includes the Oregon State Police (OSP)

4. The City of Sandy Police Department has the authority to remove stalled and parked vehicles that impede the flow of traffic.

5. Traffic flow direction may be altered, reversed, etc. at the direction of the Incident Commander when the situation warrants; and

6. Changes in traffic flow will be coordinated with the County Sheriff, Oregon State Police, Oregon Department of Transportation, and City of Sandy Public Works.

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# 2 FA 2 – Human Services

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# Table of Contents

| FA 2 Tasked Agencies | |
|---|---|
| **Primary Agencies** | City Administration |
| **Supporting Agencies** | Oregon Trail Chapter of the American Red Cross<br>Salvation Army<br>Ambulance Service: American Medical Response<br>Hospitals: Legacy Mount Hood Medical Center<br>City of Sandy Police Department<br>Clackamas Fire<br>Oregon Trail School District<br>Clackamas County Emergency Management<br>Clackamas County Health, Housing and Human Services (H3S) |

# 1 Purpose and Scope

The Human Services annex provides information regarding the City's response to the needs for **non-emergency medical** mass care/sheltering, human services, and public health support for victims of natural and technological emergencies and disasters.

The Human Services Annex includes the following functions:

- Mass Care
- Emergency Assistance
- Housing
- Human Services
- Public Health Services
- Evacuation and Population Protection
- Volunteer and Donations Management
- Care of Emergency Response Personnel and Emergency Operations Center (EOC) Staff

For larger events that may require short- or long-term housing for disaster victims, County Emergency Management would coordinate this need with the City Emergency Manager. Emergency shelter includes the use of pre-identified shelter sites in existing structures, creation of temporary facilities or shelters, and use of other facilities outside the incident area, should evacuation be necessary.

Food is provided to victims through a combination of fixed sites, mobile feeding units, and bulk distribution. Emergency first aid, consisting of basic first aid and referral to appropriate medical personnel and facilities, is provided at mass care/sheltering facilities. Bulk distribution of emergency relief items, such as

food, water, and ice is managed and coordinated via established sites within the City. If applicable to the situation, coordination and management of volunteer services and donated goods is necessary to maximize benefits without hindering response activities.

Emergency response agencies for the City will also identify and coordinate individuals with special needs within the impacted area. Special needsmay be characterized by age (children and elderly), physical and/or mental disabilities, language (non-English-speaking), existing disease/medical conditions, dependency on service animals, and any other condition or threat thatcould warrant special consideration under emergency circumstances.

# 2 Policies and Agreements

The following policies and agreements are currently in place to support emergency services for the City:

- Although a formal agreement has not been developed between the American Red Cross and the City, Human Services will be primarily implemented by American Red Cross when activated by County request. The agreement provides for shelter and mass care provisions if requested by the County.

# 3 Situation and Assumptions

## 3.1 Situation

Emergencies or disasters can require evacuation of people from residences that are temporarily uninhabitable, damaged, or destroyed. Providing for these victims will consist of making facilities and services available and coordinating activities with government agencies and volunteer disaster assistance organizations. Emergency shelter or housing needs may be short or long term. When needed, it is the responsibility of the City to work with the various human service agencies to meet sheltering requirements.

## 3.2 Assumptions

- Although City government has primary responsibility for implementing and coordinating the resources and services included in this annex, the American Red Cross will manage and coordinate sheltering and mass care operations to the extent of its capability. The Salvation Army will support these operations, and other professional and/or volunteer organizations (e.g., faith-based organizations) that normally respond to emergency/disaster situations will continue to do so.

- The American Red Cross will have agreements in place for use of specific shelters that could be activated by calling the local American Red Cross representative. These shelters may be used for specific

events associated with the City and County, as well as for housing evacuees from neighboring counties if the need should arise.

- Permission to use American Red Cross–approved facilities for disaster operations and sheltering will be obtained and agreed upon in writing. Pre-identified facilities intended for shelter and mass care will be available and operational at the time of need.
- City government and other available response agencies will manage and coordinate all shelter and mass care activities until the American Red Cross has arrived on scene, assessed the situation, and activated procedures for preparing and operating shelters.
- Assistance will be available through mutual aid agreements with the County, other counties, regions, and State and Federal emergency agencies and organizations.
- Unique demands will be placed upon the delivery of human services, including crisis counseling, emergency assistance, and the care of special needs groups. Therefore, the clientele groups of bothlocal and State human service organizations will increase.
- Under localized emergency conditions, a high percentage (50% or more) of evacuees will seek lodging with friends or relatives rather than go to established facilities.
- If the threat of an evacuation is due to a visible hazard, or has been discussed in the media, some spontaneous evacuation will occur prior to an implementing order. Therefore, mass care operations may have to commence early in any disaster period.

# 4 Roles and Responsibilities

The roles and responsibilities for each department in support of emergency services will vary depending on the type of resource, the length of the warning period, and the duration of the incident.

## 4.1 Emergency Manager

- Coordinate emergency preparedness planning and exercise activities with the American Red Cross.
- Identify local government's authority, responsibility, and role in providing long-term temporary emergency housing for disaster victims.
- Assess the situation and issue appropriate notifications to activate and staff the Emergency Operations Center (EOC), including notification

of the American Red Cross, if it is determined that a representative is needed to coordinate emergency food and shelter.

- Establish a communications link with affected jurisdictions, volunteer agencies, and the public and ensure that they are kept informed of available shelters.
- Assist in coordinating logistics to support operations and ensure that the provisions of any memorandum of understanding (MOU) are implemented, as necessary.
- Coordinate with local, State, and Federal agencies in damage assessment and cost recovery activities, as well as identifying long-term temporary emergency housing options.
- Ensure that necessary communication activities are conducted to inform the public of disaster recovery activities, including information regarding long-term temporary emergency housing assistance.
- Continue to assist in restoration of normal services and operations, as appropriate.
- Conduct an after-action debriefing/evaluation on the overall effectiveness of the City's efforts in providing emergency food and shelter.

## 4.2 American Red Cross

- Develop and maintain plans, procedures, and policies for establishing, managing, and operating a feeding and sheltering system to meet the needs created by a major disaster.
- Develop and maintain MOUs with local governments to define and clarify roles and responsibilities in preparing for and responding to disasters.
- Participate in the annual training exercises conducted by the City Emergency Management Organization to test the Emergency Operations Plan (EOP).
- Implement the response actions outlined in the MOU with the City, as necessary.
- Evaluate the direct or indirect effects of the hazard on available shelter resources.
- Provide specific resource requirements, including feeding support, clothing and bedding supplies, emergency registration of people, and trained shelter management volunteers.

- Coordinate activities with voluntary organizations active in disaster, faith-based organizations, other social service agencies, and local, State, and Federal government to provide emergency food and shelter.
- Assist the City in determining post-emergency needs for long-term emergency temporary housing, as requested.
- Prepare reports on the conditions of shelter facilities and make arrangements for returning them to normal use.
- Compile a record of emergency expenditures.
- Critique the provision of shelters for people displaced from their residences and institute reforms, as required.

### 4.3 Clackamas Fire District

- Provide personnel, supplies, materials, and facilities as available in support of this function.
- Assist with medical care and treatment, as appropriate.
- Provide fire and line safety inspections, as appropriate.

## 5 Concept of Operations

### 5.1 General

In cooperation with available volunteer disaster assistance organizations, the City Emergency Manager will make every effort to provide basic human services. Disaster victims will be encouraged to obtain housing with family or friends or in commercial facilities. To the greatest extent possible, the City will coordinate and assist with the post-disaster housing needs of the homeless. While coordinated City/American Red Cross decision-making is desirable, the American Red Cross may independently initiate operations. The Salvation Army and other charitable groups (e.g., faith-based organizations) will provide additional support for disaster victims.

In the case of unmet needs, the Emergency Manager will make requests for County assistance via the EOC to County Emergency Management. Some emergencies will not entail mass care assistance but will still require a limited amount of emergency food and clothing.

Initial preparedness efforts will begin with identification of population groups requiring special assistance during an emergency (e.g., senior citizens and the handicapped). Needs should be matched to capabilities and resources, and any gaps should be addressed through planning, training, and exercises. When an incident occurs and evacuation is required, preparations will begin for receiving evacuees at selected facilities. Essential personnel, including volunteers, will be

alerted; if any pre-positioned material resources (cots, blankets, food, etc.) are available, they will be made ready; and medical facilities will be alerted to the possibility of receiving evacuee patients. Participating agencies will provide food and clothing as needed, assist with registration of evacuees/victims, and provide information to assist victims needing additional services. Once the incident transitions to the recovery phase, human needs of victims should be continually assessed and met as necessary via one or more Disaster Resource Center (DRC).

## 5.2 Direction and Control

The City will seek the assistance of the American Red Cross and other similar agencies in implementing this section of the EOP. A liaison from the American Red Cross will be requested to report to the City EOC to assist in coordinating emergency housing, sheltering, and feeding activities; however, depending upon the size and scope of the disaster, this coordination may occur at the County EOC through the EOC's liaison at that location.

Shelter/lodging facility managers will be responsible for the operation of their individual facilities. The primary communications link between shelter facilities and the EOC will be landline and wireless telephone. If telephones cannot be used or are overloaded, law enforcement personnel will provide radio assistance. Shelter facility managers should arrange for persons in their facilities to monitor prescribed communication sources for guidance and announcements.

# 6 City of Sandy Human Services Functions

## 6.1 Mass Care

Mass care includes the registration of evacuees, the opening and management of temporary lodging facilities, and the feeding of evacuees and workers through both mobile and fixed feeding sites. The American Red Cross will assist in registering evacuees and, as applicable, coordinate information with appropriate government agencies regarding evacuees housed in American Red Cross Shelters.

### 6.1.1 Shelter

Protective shelters are life-preserving; they are designed to afford protection from the direct effects of hazard events and may or may not include the life-supporting features associated with mass care facilities. In contrast, mass care facilities are life-supporting; they provide protection from the elements and basic life-sustaining services when hazard events result in evacuations. The latter category of facilities is the focus of this annex and is designated as Reception and Care facilities in local American Red Cross Sheltering Plans.

The designation of specific lodging and feeding facilities will depend on the actual situation and the location of the hazard area. Public school facilities will receive prime consideration for use as emergency mass care facilities; such use will be coordinated with school officials. Selected facilities will be located far enough away from the hazard area to preclude the possibility of the threat

extending to the mass care facility. Agreements for use of some facilities have been obtained by the American Red Cross. The City Manager, or designee, will obtain permission from owners to use other facilities as required. When American Red Cross facilities are opened, it will be the responsibility of the American Red Cross to maintain all functions and staffing according to American Red Cross policy. The American Red Cross will maintain listings of qualified and trained shelter and lodging facility managers.

Options for temporary shelter available to the City during the first 72 hours of an incident include:

- Predetermined sheltering sites and supplies available through the American Red Cross.
- General purpose tents available through the Oregon National Guard and requested by the County EOC to Oregon Emergency Management.
- If a Presidential Declaration has been made, temporary buildings or offices requested through the Federal Coordinating Officer.

A designated member of the City EOC staff may serve as the City Shelter Coordinator. Services will be provided through the coordinated efforts of staff members, the American Red Cross, the Salvation Army, other State-supported agencies, volunteer agencies, and mutual aid agreements with various support groups. Law enforcement agencies will provide security at shelter facilities, where possible, and will also support back-up communications, if needed.

Food will be provided to victims through a combination of fixed sites, mobile feeding units, and bulk distribution. Feeding operations are based on nutritional standards and, if possible, should include provisions for victims with special dietary needs. The American Red Cross will be responsible for meal planning, coordination of mobile feeding, and identifying feeding sites and resources for the procurement of food and related supplies. The American Red Cross will coordinate all mass feeding and other services needed at open shelters within the City's jurisdiction with City Emergency Management via the City EOC.

### 6.1.2 Sheltering Service and Companion Animals

The City, the American Red Cross, and other organizations or groups providing sheltering and mass care will comply with Americans with Disabilities Act (ADA) requirements for service animals, facility owners' limitations, and County and State of Oregon Health Code requirements.

### 6.1.3 Bulk Distribution

Emergency relief items to meet urgent needs are distributed via established sites within the affected area. Distribution of food, water, and ice through Federal, State, and local governmental entities and nongovernmental organizations is coordinated at these sites. The American Red Cross will coordinate all bulk

distribution activities needed within the City's jurisdiction with the City Emergency Manager via the City EOC.

Agencies and organizations involved in supporting and managing bulk distribution include:

- City Administration
- Clackamas District
- American Red Cross
- Salvation Army
- Private-sector partners
- Disaster assistance personnel, including both paid and volunteer staff.

## 6.2 Emergency Assistance

### 6.2.1 Disaster Welfare Information

Disaster Welfare Information collects and provides information regarding individuals residing within the affected area to immediate family members outside the affected area. The system also aids in reunifying family members within the affected area. The American Red Cross will establish a Disaster Welfare Inquiry Operation to answer requests from relatives and friends concerning the safety and welfare of evacuees or those in disaster areas. Welfare inquiry listings, along with registration listings, will be coordinated with the EOC and law enforcement agencies for comparison with missing persons lists. County Amateur Radio Emergency Services provides support to the American Red Cross and City Administration in gathering, disseminating, and managing disaster welfare information.

### 6.2.2 Disaster Resource Center(s)

Upon a Presidential disaster declaration, DRCs may be established. In addition to numerous grant and assistance programs available through the DRC, the Individual and Family Grant Program provides grants to meet disaster-related necessary expenses or serious needs for which assistance by other means is either unavailable or inadequate.

Logistics Section personnel may be called upon to arrange a large facility (often a school, church, or community center) to serve as a DRC. The Federal Emergency Management Agency is responsible for operating DRCs, which are often located in facilities such as schools, churches, and community centers. A DRC provides a location where citizens can meet with local, State, Federal, and volunteer agency representatives to apply for disaster assistance. Advertising of these facilities will be coordinated by the Public Information Officer through the Joint Information Center, located in the Federal/State disaster field office. Federal, State, local, and

volunteer agencies may provide or accept applications for the following services through the DRC:

- Temporary housing for disaster victims whose homes are uninhabitable because of a disaster.
- Essential repairs to owner-occupied residences in lieu of temporary housing so that families can return to their damaged homes.
- Disaster unemployment and job placement assistance for those who have become unemployed because of a major disaster.
- Disaster loans to individuals, businesses, and farmers for refinancing, repair, rehabilitation, or replacement of damaged real and personal property not fully covered by insurance.
- Agricultural assistance payments, technical assistance, and Federal grants for the purchase or transportation of livestock.
- Information regarding the availability of and eligibility requirements for food stamps.
- Individual and family grants to meet disaster-related expenses and other needs of those adversely affected by major disasters when they are unable to meet such needs through other means.
- Legal counseling to low-income families and individuals.
- Tax counseling concerning various disaster-related benefits.
- Consumer counseling and assistance in obtaining insurance benefits.
- Crisis counseling and referrals to mental health agencies to relieve disaster-caused mental health problems.
- Social Security assistance for those who are eligible, such as death or disability benefits or monthly payments.
- Veterans' assistance such as death benefits, pensions, insurance settlements, and adjustments to home mortgages held by the Veterans Administration (VA) if a VA-insured home has been damaged.
- Other specific programs and services appropriate to the disaster.

Logistics may also arrange office space, document reproduction services, etc. for State and Federal damage assessment teams.

If Federal mobile homes are to be supplied for use as emergency shelter, the Logistics section may assist in site choice and preparation consistent with the City's local comprehensive land use plan.

## 6.3 Long-Term Housing

All housing needs identified during and following emergency incidents or disasters impacting the City will be coordinated through the County Emergency Management Director via the County EOC. In some disaster situations, the Federal government may be requested to provide emergency housing. Disaster victims will be encouraged to obtain housing with family, with friends, or in commercial facilities. To the greatest extent possible, local, and County government will coordinate post-disaster housing needs for the homeless population.

## 6.4 Human Services

### 6.4.1 Special Needs Populations

Disaster victims and special needs populations may require assistance to meet their necessary expenses and needs (food, clothing, housing, medical, and financial). Local and State human service organizations will identify any special needs groups (e.g., elderly, handicapped, and non-English-speaking) and, in the event of a disaster, ensure that their needs are met. The City will seek the assistance of County Health, Housing and Human Services and other human service agencies or organizations to assist in coordinating the emergency housing, sheltering, and feeding of special needs populations.

Coordinating and identifying individuals with special needs within the impacted area is a critical element of emergency response and recovery operationsfor the City. Special needs may be characterized by age (children and elderly), physical and/or mental disabilities, language (non-English-speaking), disease/medical conditions, service animals, and any other conditions or traits thatcould warrant special considerations under emergency circumstances.

Agencies and organizations involved in managing, transporting, and communicating with special needs populations during an emergency and pertaining to mass care include:

- City Administration
- Area hospitals
- Private clinics and care facilities
- American Red Cross and other volunteer agencies
- School districts
- Local radio stations serving the City.

Nursing Homes and Residential Care Facilities are required to have disaster and emergency plans in place that ensure the transfer of clients to appropriate facilities.

Special needs populations can be broken down into the three categories of sheltering outlined below.

### Category 1: Hospitalization

Category 1 comprises persons who require recurring professional medical care, special medical equipment, and/or continual medical surveillance. Examples include persons who are dependent upon ventilators, IVs, or oxygen-supplementation; those with chest pain or shortness of breath; and others requiring the intensity of services provided at a hospital or skilled nursing facility.

### Category 2: Special Needs Shelter

Category 2 includes persons who require some medical surveillance and/or special assistance. These are individuals whose age, frailty, mobility, or functional or medical disabilities make them particularly vulnerable in disaster situations. They may have medical impairments but have been able to maintain some independence prior to the disaster or emergency. Examples are those with mental illness, severely reduced mobility, or medical impairment thatdoes not preclude activities with some assistance.

### Category 3: General Shelter

Category 3 includes persons who are independent prior to the disaster or special emergency or who may have pre-existing health problems that do not impede activities of daily living. Examples are persons with prostheses or hearing or speech impediments, wheelchair users with no medical needs, or those with controlled diseases such as diabetes, muscular dystrophy, or epilepsy.

### 6.4.2 Crisis Counseling and Mental Health Providers

Agencies and organizations involved with providing crisis counseling and mental health support to victims and families, the first responder community, and special needs populations include:

- Area hospitals
- County and regional volunteer organizations
- Local nursing homes and care facilities.

*See the Clackamas County EOP, ESF 6 – Mass Care, Emergency Assistance, Housing, and Human Services for more detail.*

## 6.5 Public Health Services

Available emergency medical resources for the City consist of Legacy Mount Hood Medical Center and American Medical Response.

County Health, Housing and Human Services will direct the County response to medical and health emergency issues.

*See the Clackamas County EOP, ESF 8 – Public Health and Medical Services for more detail.*

## 6.6 Volunteer and Donations Management

The City Emergency Manager will coordinate and manage volunteer services and donated goods through appropriate liaisons assigned at the City EOC, with support from the American Red Cross, Salvation Army, and other volunteer organizations. These activities seek to maximize benefits without hindering emergency response operations. Procedures for accessing and managing these services during an emergency will follow Incident Command System (ICS)/National Incident Management System (NIMS) standards.

## 6.7 Care of Response Personnel and Emergency Operations Center Staff

Arrangements for the feeding and sheltering of EOC staff is the responsibility of the Logistics Section. As space allows, EOC staff will sleep and eat at the EOC. Sleeping areas may also be set up in other facilities.

Response personnel will be released to their homes or stations to sleep. If necessary, space may be arranged in a shelter. This shelter should be different than the one used for disaster victims or evacuees.

Families of response personnel may be sheltered together in the event of an extended incident involving a major shelter operation. This will facilitate keeping families informed and help maintain the morale of response personnel.

# 7 Supporting Plans and Procedures

- County Emergency Operations Plan
  - ESF 6 – Mass Care, Emergency Assistance, Housing and Human Services
  - ESF 8 – Public Health and Medical Services
  - ESF 11 – Agriculture and Natural Resources
  - ESF 14 – Long-Term Community Recovery
  - SA E – Animals in Disaster

# 8 Appendices

- Appendix A Shelter Materials
  - A-1 Potential Shelter Locations
  - A-2 Shelter Survey Form
  - A-3 Sample Shelter Agreement

# Appendix A Shelter Materials

A-1 Potential Shelter Locations

A-2 Shelter Survey Form

A-3 Sample Shelter Agreement

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## Appendix A-1 Potential Shelter Locations

***For Official Use Only***

The following facilities have current shelter agreements. **Only the American Red Cross can activate these agreements (24-Hour Line: 503-284-1234).** The Emergency Manager may request that a shelter be opened by calling Clackamas County Emergency Management.

| Name | Street Address | Zip |
|---|---|---|
| Sandy High School | 37400 Bell Street, Sandy OR | 97055 |
| | | |
| | | |
| | | |
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## Appendix A-2 Shelter Survey Form

*This form is intended to record information needed to make decisions when it becomes necessary to open a shelter.*

**Directions:**
**Please print all information.** Complete one survey for each area within a facility that is to be used as a shelter or, if the entire facility is to be used as a shelter, for each facility. Complete all sections as thoroughly as possible, indicating numbers, space dimensions, etc.

This form is generic to many types of facilities; some of the questions on this form may not apply to every site. In such cases, answer not applicable (N/A).

### General Facility Information

**Facility Information**

| | |
|---|---|
| Facility Name: | |
| Name/description of area in this facility being surveyed for use as a shelter (e.g. Gymnasium): | |
| Are there other areas in this facility being surveyed? If yes, name them. | |
| Governing Agency/Owner: | |
| Street Address: | |
| Town/City: | Zip Code: |
| Latitude: | Longitude: |
| Map Locator Information (map name, page, grid): | |
| Mailing Address (if different): | |
| Business Phone Number: ( ) - | Fax Number: ( ) - |
| Email address (if applicable): | |

| **Primary Contact to Authorize Facility Use:** | **Alternate Contact to Authorize Facility Use:** |
|---|---|
| Name:<br>_____<br>Day Phone: (_____)_____-_____<br>After Hours/Emergency Phone: (_____)_____-_____<br>Mobile Phone: (_____)_____-_____<br>Email:_____ | Name:<br>_____<br>Day Phone: (_____)_____-_____<br>After Hours/Emergency Phone: (____)_____-_____<br>Mobile Phone: (_____)_____-_____<br>Email:_____ |

| **Primary Contact to Open Facility:** | **Alternate Contact to Open Facility:** |
|---|---|
| Name: _____ | Name: _____ |
| Day Phone: (_____)_____-_____ | Day Phone: (_____)_____-_____ |
| After Hours/Emergency Phone: (_____)_____-_____ | After Hours/Emergency Phone: (____)_____-_____ |
| Mobile Phone: (_____)_____-_____ | Mobile Phone: (_____)_____-_____ |
| Email: _____ | Email: _____ |

## Facility Physical Information

*****Attach a sketch or copy of the facility floor plan. *****

### Availability for Use/Use Restrictions

Some facilities are only available during certain times due to other activities. Please indicate the periods that the facility is available.

☐ Facility available for use at any time of the year

☐ Facility **only** available for use during the following time periods:
From: to
From: to

☐ Facility **is not** available for use during the following time periods:
From: to
From: to

Is the facility within 5 miles of an evacuation route? ☐ Yes ☐ No

Is the facility within 10 miles of a nuclear or hazardous materials storage or disposal site? ☐ Yes ☐ No

Are there trees, towers or other potential hazards that could impact the safety of the facility or block access to it after a disaster? ☐ Yes ☐ No
If yes, please describe:

Is smoking allowed in the facility buildings? ☐ Yes ☐ No
Is smoking allowed on the facility grounds? ☐ Yes ☐ No

### Capacity

**Shelter Capacity - How many persons can be accommodated for sleeping?**

Area available for shelter use:

Length:_____ x Width:_____ = Total Area: _____

**Record only useable space.** For example, if a room is 600 square feet but has furniture or fixtures that occupy half of that space and can't or won't be removed, the useable space is 300 square feet.

The area listed above ☐ is ☐ is not ☐ is partially disabled accessible.

**Calculation of Shelter Capacity** (Total Area ÷ Square feet per person = Capacity)

Recommended range of square feet per person by shelter type:
Evacuation shelter: 15 to 30 square feet per person
General shelter: 40 to 60 square feet per person
Special Needs Shelter: 80 square feet per person

| Type of Shelter | Total Area | Square Feet/ per person | Capacity * |
|---|---|---|---|
| ☐ Evacuation | | | |
| ☐ General | | | |
| ☐ Special Needs | | | |

* Does the actual layout of the area being surveyed decrease the usable space and significantly impact the capacity of the area? If so, explain.

**Seating Capacity - How many persons can be accommodated in fixed (not pull-out) seating areas (bench and flip-up type seating)?**

| | |
|---|---|
| ☐ Bench | Measured Linear Feet of Bench_____ ÷ 16 $ft^2$/person = Bench Seating Capacity _____ |
| ☐ Chairs | Number of Chairs Counted =_____ = Seating Capacity _____ |
| ☐ Not applicable | |

**Parking**

Number of on-site parking spaces (do not include on-street parking in this figure):

Number of handicap parking spaces:

Do curb cuts exist in and exiting the parking area that are at minimum 35 inches wide? ☐ Yes ☐ No

| When the facility **is** in normal use (i.e., school in session): | When the facility **is not** in normal use (i.e., school not in session): |
|---|---|
| ☐ On-site parking is adequate for shelter residents<br>☐ Off-site parking is available as noted below (e.g. on streets around the school):<br>_____<br>_____<br>☐ There is **not** adequate on-site or off-site parking available | ☐ On-site parking is adequate for shelter residents<br>☐ Off-site parking is available as noted below (e.g. on streets around the school):<br>_____<br>_____<br>☐ There is **not** adequate on-site or off-site parking available |

**General Facility Construction**

| Facility Construction | Number of stories: | Approximate year of construction: |
|---|---|---|
| ☐ Wood frame ☐ Prefabricated<br>☐ Concrete ☐ Trailer<br>☐ Masonry ☐ Bungalow<br>☐ Metal ☐ Pod<br>☐ Portable Classroom ☐ Other<br>If 'Other,' describe: | Elevator:<br>☐ Yes ☐ No<br>Where, in relation to shelter area? | Chair Lift:<br>☐ Yes ☐ No<br>Quantity: |

| | |
|---|---|
| ☐ Accessible doorways (minimum 35 inches wide) | ☐ Ramps ( minimum 35 inches wide):<br>☐ Fixed ☐ Portable<br>☐ Level Landings |
| ☐ Automatic doors or appropriate door handles | |

Open Space: Indicate quantity and size (square feet)
☐ Athletic Field(s):
☐ Fenced Court(s):
☐ Secured playground area
☐ Other:

**Fire Safety**

*Some facilities are that appear to be suitable for sheltering might not meet local fire codes based on building capacity. It is recommended that local codes be examined to determine if the facility meets them.*

| | |
|---|---|
| Does the facility have inspected fire extinguishers? | ☐ Yes ☐ No |
| Does the facility have functional fire sprinklers? | ☐ Yes ☐ No |
| Does the facility have a fire alarm? | ☐ Yes ☐ No |
| If yes, choose one: | ☐ Manual (pull down) ☐ Automatic |
| Does the fire alarm directly alert the fire department? | ☐ Yes ☐ No |
| Does the facility have an internal fire hose system? | ☐ Yes ☐ No |
| Does the facility have smoke detectors in/near the shelter area? | ☐ Yes ☐ No |

**Sanitation Facilities**

Indicate the quantity of only those sanitation facilities that will be accessible to shelter staff and residents near the area being surveyed for use as a shelter. If more than one area within the facility is being surveyed, only describe the sanitation facilities that will be for the exclusive use of the shelter area described in this survey.

**Standards for ADA compliant accessible features for people with disabilities**:

Toilets: Bathroom stall (38 inches wide); Grab bars (33-36 inches wide)

Showers: Shower stall (36 in x 36 in); Grab bars (33–36 inches in height); Shower seat (17–19 inches in height); Fixed shower heat (48 inches in height) or hand-held spray unit with hose accessible for people with disabilities:

Sinks: Sink (34 inches in height); Towel dispenser (39 inches in height)

| | Urinals | | Toilets | | Showers | | Sinks | |
|---|---|---|---|---|---|---|---|---|
| | ADA compliant | Not compliant | ADA compliant | Not compliant | ADA compliant | Not compliant | ADA compliant | Not compliant |
| **Men's** | | | | | | | | |
| **Women's** | | | | | | | | |
| **Unisex** | | | | | | | | |
| **Total** | | | | | | | | |

Are there any limitations on the availability of these facilities? ☐ Yes ☐ No

If yes, describe limitations. (Only during specific time blocks, etc.):

Are there baby diaper changing tables in any of the restroom facilities? ☐ Yes ☐ No

| Food Preparation Facilities | | |
|---|---|---|
| ☐ There are no food preparation or food service capabilities at this facility | | |
| ☐ Full-Service Kitchen: food is stored, prepared and served on site.<br>If full-serviced, number of meals that can be produced: _____ | | |
| ☐ Food is prepared off site by a central kitchen and served on site<br>Central Kitchen Contact:_____Phone Number: ( ) | | |
| ☐ Warming oven kitchen | | |
| **Appliances/Equipment**: Indicate quantity and size (square feet) as appropriate. | | |
| Refrigerators: | Walk-in Refrigerators: | Industrial Refrigerators: |
| Freezers: | Walk-in Freezers: | Roasters: |
| Burners: | Griddles: | Warmers: |
| Ovens: | Convection ovens: | Microwaves: |
| Steamers: | Steam kettles: | Food processors: |
| Ice Machines: | Sinks: | Number of sink compartments: |
| Commercial dishwasher *(approved sanitation levels):* | Non-commercial dishwasher: | |
| Location of equipment if in area other than kitchen: | | |

| Dining Facilities | |
|---|---|
| Dining area on site:<br>☐ Yes ☐ No | Location: |
| Snack Bar:<br>☐ Yes ☐ No | If yes, seating capacity: |
| Cafeteria:<br>☐ Yes ☐ No | If yes, seating capacity: |
| Other indoor seating:<br>☐ Yes ☐ No | If yes, describe, include size and seating capacity: |
| Total estimated seating capacity for eating: | |

**Standards for accessible for people with disabilities**

Tables (28–34inches in height); Serving line/counter (28–34 inches in height); Aisles (minimum 38 inches wide)

| Are there accessible tables?<br>☐ Yes ☐ No<br>If yes, number: | Are serving line/counters accessible?<br>☐ Yes ☐ No | Are aisles accessible?<br>☐ Yes ☐ No |
|---|---|---|

| |
|---|
| Additional comments related to food preparation or dining areas: |

| **Health Service Facilities** | |
|---|---|
| Number of private rooms available: | Access to locked refrigeration? ☐ Yes ☐ No |
| Total square footage of available space for heath care needs: | |
| Location of health service area: | |

| **Laundry Facilities** | |
|---|---|
| Number of clothes washers: | Number of clothes dryers: |
| Availability to shelter operator | ☐ Yes ☐ No |
| Are laundry facilities coin operated? | ☐ Yes ☐ No |
| Special conditions or restrictions: | |

## Facility Services Information

| **Electricity** | | |
|---|---|---|
| Emergency (generator power) on site: ☐ Yes ☐ No | Capacity in kilowatts: | |
| Is facility staff required to operate emergency generator? ☐ Yes ☐ No | | |
| This generator powers:<br>☐ Throughout the shelter area.<br>☐ Only emergency lights and other critical circuits in shelter area.<br>☐ No generator serves the shelter area. | | |
| Estimated run-time without refueling (in hours): | ☐ Auto start<br>☐ Manual start | Fuel type: |
| Emergency fuel serve (fuel reserve) availability:<br>☐ Yes ☐ No | If yes, quantity (in gallons): | |
| Utility company/vendor: | Emergency phone number:<br>( ) - | |
| Generator fuel vendor: | Emergency phone number:<br>( ) - | |
| Generator repair contact: | Emergency phone number:<br>( ) - | |

| **Heating** |
|---|
| Source of heat: ☐ Electric ☐ Natural Gas ☐ Propane ☐ Oil ☐ Gasoline ☐ Diesel |
| Shelter area is heated: ☐ Yes ☐ No |

| | |
|---|---|
| Utility/vendor: | Emergency phone number:<br>( ) - |
| Repair company: | Emergency phone number:<br>( ) - |
| **Cooling** | |
| Source of cooling: ☐ Electric ☐ Natural Gas ☐ Propane | |
| Shelter area is air conditioned: ☐ Yes ☐ No | |
| Utility/vendor: | Emergency phone number:<br>( ) - |
| Repair company: | Emergency phone number:<br>( ) - |
| **Water** | |
| Source of water: ☐ Municipal ☐ Well(s) ☐ Trapped Water | |
| If trapped, potable (*drinkable*) storage capacity in gallons: | Non-potable (*undrinkable*) storage capacity in gallons: |
| Utility/vendor: | Emergency phone number:<br>( ) - |
| Repair company: | Emergency phone number:<br>( ) - |
| **Cooking**: *refer to **Food Preparation Facilities** for additional information on facility cooking capacities. | |
| Source of cooking energy: ☐ Electric ☐ Natural Gas ☐ Propane | |
| Utility/vendor: | Emergency phone number:<br>( ) - |
| Repair company: | Emergency phone number:<br>( ) - |

## Communications Information

| |
|---|
| **Radio**: |
| Is there a NOAA Weather Radio at this facility? ☐ Yes ☐ No<br>If yes, where is it located? |
| Is there an emergency communications (ham) radio at this facility? ☐ Yes ☐ No<br>If yes, where is it located?<br>Who is trained/authorized to operate it? Name: Contact #: ( ) |
| **Telephone/fax machines**: |
| Telephone service: ☐ Traditional land-line ☐ VOIP (internet line) |

| | |
|---|---|
| Are there business telephone available to shelter staff:<br>☐ Yes ☐ No | If yes, list any restrictions: |
| Business telephone available to shelter occupants:<br>☐ Yes ☐ No | If yes, list any restrictions: |
| Are there accessible (49 inches from floor) telephones?<br>☐ Yes ☐ No<br>If yes, number of accessible phones: | Is there Telecommunications Device for the Deaf (TDD) availability?<br>☐ Yes ☐ No |
| Are there earpiece telephones (volume adjustable)?<br>☐ Yes ☐ No | Are there Fax machines available to shelter staff?<br>☐ Yes ☐ No |
| Is there speaker telephone/conference availability?<br>☐ Yes ☐ No | Total number of fax machine telephone lines: |
| Utility/vendor: | Emergency phone number:<br>( ) - |
| Repair company: | Emergency phone number:<br>( ) - |
| **Computers**: | |
| Type of internet service connection: ☐ Dial-up ☐ High-Speed ☐ Cable ☐ Wireless | |
| Computers available to shelter staff:<br>☐ Yes ☐ No | Is there public access to computers?<br>☐ Yes ☐ No |
| Number of computers: | |
| Location of computers for evacuee use: | |
| Utility/vendor: | Emergency phone number:<br>( ) - |
| Repair company: | Emergency phone number:<br>( ) - |
| **Television:** | |
| Is there a TV available for shelter use? | ☐ Yes ☐ No |
| Location of cable TV drop for shelter area: | |

## Shelter Management Information

This section is designed to identify shelter use capabilities of the facility for registration, management, and pet-care.

| **Shelter Management** | |
|---|---|
| Location of shelter registration: | Is there a computer network drop in this area?<br>☐ Yes<br>☐ No |

| | |
|---|---|
| Location of office for shelter management team: | Is there a computer network drop in this area?<br>☐ Yes<br>☐ No |
| | Phone number in this office: |
| Shelter supply kit is located: | |
| Key for kit is located: | |

**Pet Care Capacity**: if applicable

Pets could be housed:

☐ On-site in existing facility — Capacity:_____
☐ On-site using additional resources (Tents/Trailers) — Capacity:_____
☐ Combination of existing facility and additional resources
☐ Off-Site

| | |
|---|---|
| Location of pet intake area: | Location of pet shelter area: |

Is the space used for the pet shelter area near chemicals: ☐ Yes ☐ No

Location of outdoor pet walking area:

**Facility Staff**

| | | |
|---|---|---|
| Facility personnel required when using facility: | ☐ Yes | ☐ No |
| Facility kitchen staff required when using facility kitchen: | ☐ Yes | ☐ No |
| Voluntary organizations *(such as church or fire auxiliaries)* required when using the facility: | ☐ Yes | ☐ No |
| Sanitation/Maintenance staff required: | ☐ Yes | ☐ No |
| Will any of the above groups be experienced or trained in shelter management? | ☐ Yes | ☐ No |

**Shelter Agreement Information**

| | | |
|---|---|---|
| Does the facility/owner have a current agreement for use as emergency shelter? | ☐ Yes | ☐ No |

Date: Updated:

Additional information about agreement, if applicable:

Additional Notes (use additional page as needed):

| **Survey completed/updated by:** | **Date:** |
|---|---|
| *Printed name and title of authorized facility personnel:* | *Signature of authorized personnel:* |
| *Agency/Organization of authorized facility personnel:* | |
| *Printed name and title of shelter surveyor:* | *Signature of shelter surveyor* |
| *Agency/Organization of surveyor:* | |

Shelter Determination:

- ☐ Facility can be used as general emergency shelter.
- ☐ Facility can be used as an evacuation shelter.
- ☐ Facility can be used as a special needs shelter.
- ☐ Facility can be used as a pet-friendly shelter
- ☐ Facility will not be used as a shelter.

Facility is ADA Compliant: ⚐ Partially ⚐ Fully ⚐ Not ADA Accessible

Is this shelter entered in the National Shelter System (NSS)? ☐ Yes ☐ No

NSS ID:_____

## Appendix A-3 Sample Shelter Agreement

The City of Sandy coordinates the provision of mass care services to individuals, families, and communities impacted by a disaster. Certain disaster relief activities are supported by private facility owners who permit their buildings to be used as a temporary shelter for disaster victims and designated community organizations, like the American Red Cross or Salvation Army, who support relief activities. This agreement is between the City of Sandy Administration and a facility owner ("Owner") so that the City can use the facility as an emergency shelter during a disaster that directly or indirectly impacts the City.

### Parties and Facility

**Owner:**

Legal name: _____

Chapter: _____

**24-Hour Point of Contact:**

Name and title: _____

Work phone: _____ Cell phone/pager: _____

**Address for Legal Notices:**

_____

_____

_____

**City of Sandy**

County Department/Agency: _____

**24-Hour Point of Contact:**

Name and title: _____

Work phone: _____ Cell phone/pager: _____

**Address for Legal Notices:**

_____

_____

_____

*Copies of legal notices must also be sent to:*

[insert contracts/procurement department information]

**Shelter Facility:**

(Insert name and complete street address of building or, if multiple buildings, write "See attached facility list" and attach a facility list including complete street address of each building that is part of this Agreement).

_____

_____

_____

_____

## Terms and Conditions

- Use of Facility: Upon request and if feasible, the Owner will permit the City of Sandy to use the Facility on a temporary basis as an emergency public shelter.
- Shelter Management: The City of Sandy will have primary responsibility for the operation of the shelter and will designate a relief organization personnel member as the Shelter Manager, to manage the sheltering activities. The Owner will designate a Facility Coordinator to coordinate with the Shelter Manager regarding the use of the Facility by the City of Sandy.
- Condition of Facility: The Facility Coordinator and Shelter Manager (or designee) will jointly conduct a pre-occupancy survey of the Facility before it is turned over to the City of Sandy to record any existing damage or conditions. The Facility Coordinator will identify and secure all equipment that the City of Sandy should not use while sheltering in the Facility. The City of Sandy will exercise reasonable care while using the Facility as a shelter and will make no modifications to the Facility without the express written approval of the Owner.
- Food Services: Upon request by the City of Sandy, or Shelter Manager, and if such resources exist and are available, the Owner will make the food service resources of the Facility, including food, supplies, equipment, and food service workers, available to feed the shelter occupants. The Facility Coordinator will designate a Food Service Manager to coordinate the provision of meals at the direction of and in cooperation with the Shelter Manager. The Food Service Manager will establish a feeding schedule, determine food service inventory, and needs, and supervise meal planning and preparation. The Food Service Manager and Shelter Manager will jointly conduct a pre-occupancy inventory of the food and food service supplies in the Facility before it is turned over to the City of Sandy.

- Custodial Services: Upon request by the City of Sandy and if such resources exist and are available, the Owner will make the Facility's custodial resources, including supplies and custodial workers, available to provide cleaning and sanitation services at the shelter. The Facility Coordinator will designate a Facility Custodian to coordinate the provision of cleaning and sanitation services at the direction of and in cooperation with the Shelter Manager.
- Security: In coordination with the Facility Coordinator; the Shelter Manager, as he or she deems necessary and appropriate, will coordinate with law enforcement regarding any public safety issues at the shelter.
- Signage and Publicity: The City of Sandy may post signs identifying the shelter as a City of Sandy emergency shelter in locations approved by the Facility Coordinator and will remove such signs when the shelter is closed. The Owner will not issue press releases or other publicity concerning the shelter without the express written consent of the Shelter Manager. The Owner will refer all media questions about the shelter to the Shelter Manager.
- Closing the Shelter: The City of Sandy will notify the Owner or Facility Coordinator of the closing date for the shelter. Before the County vacates the Facility, the Shelter Manager and Facility Coordinator will jointly conduct a post-occupancy survey, to record any damage or conditions. The Shelter Manager and Facility Coordinator or Food Service Manager will conduct a post-occupancy inventory of the food and supplies used during the shelter operation.
- Reimbursement: The City of Sandy will reimburse the Owner for the following:
    - *Damage to the Facility or other property of Owner*, reasonable wear and tear excepted, resulting from the operations of the City of Sandy. Reimbursement for facility damage will be based on replacement at actual cash value. The City of Sandy will select from among bids from at least three reputable contractors. The City of Sandy is not responsible for storm damage or other damage caused by the disaster.
    - *Reasonable costs associated with custodial and food service personnel* that would not have been incurred but for the City of Sandy's use of the Facility for sheltering. The City of Sandy will reimburse at per-hour, straight-time rate for wages actually incurred but will not reimburse for (i) overtime or (ii) costs of salaried staff.
    - *Reasonable, actual, out-of-pocket operational costs*, including the costs of the utilities indicated below, to the extent that such

costs would not have been incurred but for the City of Sandy'suse of the premises (both parties must initial all utilities to be reimbursed by the City of Sandy):

| | Owner initials | County initials |
|---|---|---|
| Water | | |
| Gas | | |
| Electricity | | |
| Waste Disposal | | |

The Owner will submit any request for reimbursement to the County within 60 days after the shelter closes. Any request forreimbursement for food, supplies or operational costs must be accompanied by supporting invoices. Any request for reimbursement for personnel costs must be accompanied by a list of the personnel with the dates and hours worked at the shelter.

- Insurance: The City of Sandy, and designated relief organizations support mass care activities and shall carry insurance coverage in the amounts of at least $1,000,000 per occurrence for Commercial General Liability and Automobile Liability. The City of Sandy shall also carry Workers' Compensation coverage with statutory limits for the jurisdiction within which the facility is located and $1,000,000 in Employers' Liability.
- Indemnification: The City of Sandy shall defend, hold harmless, and indemnify the Owner against any legal liability, including reasonable attorney fees, in respect to bodily injury, death and property damage arising from the negligence of the City of Sandy during the use of the premises.
- Term: The term of this agreement begins on the date of the last signature below and ends 30 days after written notice by either party.

| | |
|---|---|
| Owner (legal name) | |
| By (signature) | By (signature) |
| Name (printed) | Name: |
| Title | Title : |
| Date | Date |

# 3 FA 3 – Infrastructure Services

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# Table of Contents

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| FA 3 Tasked Agencies | |
|---|---|
| **Primary Agencies** | City of Sandy Public Works Department |
| **Supporting Agencies** | Clackamas County Transportation and Development<br>Oregon Department of Transportation<br>Water: City of Sandy<br>Sewer: City of Sandy<br>Electricity: Portland General Electric<br>Gas: NW Natural Gas<br>Telephone(s): Verizon, Qwest, Comcast, Sandy Net |

# 1 Purpose and Scope

The Infrastructure Services annex provides information regarding the coordination of infrastructure, public works, damage assessment, and engineering services during all phases of emergency management. Public works resources (personnel, equipment, facilities, materials, and supplies) will be coordinated through the City Public Works Department or the City Emergency Operations Center (EOC) (depending on the situation) following established procedures and agreements. Resources may also be obtained through contractors, vendors, and suppliers. This support function contains various sub-functions that are outlined below.

Functions covered in the Infrastructure Services annex include:

- Transportation
- Infrastructure Repair and Restoration
- Energy and Utilities
- Damage Assessment
- Debris Management

# 2 Policies and Agreements

The following policies and agreements are currently in place to support infrastructure services for the City:

- Oregon Water/Wastewater Agency Response Network (ORWARN); ORWARN is composed of member utilities providing voluntary, emergency assistance to each other. ORWARN facilitates rapid and short-term deployment of emergency services, in the form of personnel, equipment, and materials.

# 3 Situation and Assumptions

## 3.1 Situation

The City has identified critical infrastructure and resources to be protected and prioritized during an emergency event or disaster, to the greatest extent possible. During an emergency, the protection of human lives will take precedence during all facets of response, and essential services within the City will be maintained as long as conditions permit.

In addition, a utility failure would impact the availability of essential services such as the water supply, electrical power, natural gas, telephone, and sanitary sewer services. While causes of a failure may be natural or human-induced, the severity of the incident must be measured by the duration of the disruption of the service and its impact on life and property.

## 3.2 Assumptions

- Response operations for the City Public Works Department will include assisting police and fire in traffic control and rescue operations and clearing and maintaining critical lifeline routes.
- In a natural hazards event such as flood, windstorm, or earthquake response, the City Public Works Department will generally assume or be assigned the lead agency role.

# 4 Roles and Responsibilities

## 4.1 General Responsibilities

The activities and responsibilities for each department in support of infrastructure services will vary depending on the type of resource, length of the warning period, and duration of the incident.

### 4.1.1 Emergency Manager

- Regularly brief Mayor and Council on developments in the situation.
- Collect resource requirement information from all City departments and the Clackamas Fire District.
- Evaluate the situation and determine whether plan implementation is called for.
- Assess developing conditions and evaluate their potential impact.
- Research sources of needed resources.
- Establish and maintain contact with the County; provide updates on conditions.

- Consider activating the EOC.

- Document actions taken and costs incurred.
- Facilitate post-incident analysis.

### 4.1.2 Public Works

Public Works is responsible for:

- Developing and maintaining an emergency notification list of department personnel.
- Opening emergency response routes for rescue and lifesaving operations.
- Restoring streets and managing street traffic, including traffic control devices.
- Restoring wastewater (sanitary sewer) and storm water system capacities.
- Restoring and operating sanitary sewer pump stations and pressure mains.
- Interfacing with utility providers to ensure timely restoration of services.
- Removing and disposing of debris from public rights-of-way and City property that was a direct result of a disaster event.
- Maintaining storm water flow.
- Administrating existing contracts, and developing new ones, to restore infrastructure and services.
- Keeping the City's Fleet operational and providing emergency fuel supplies and equipment necessary to provide for the public's safety, health, and wellbeing; this will be given top priority during an emergency.
- Keeping the City's emergency generators operational.
- Coordinating with Police to assist in traffic control.
- Developing and maintaining operating procedures for disaster response.
- Establishing contracts and relationships with contractors and vendors important to repair and restoration of County infrastructure.

- Requesting assistance through the County, if necessary.
- Documenting incident actions and costs incurred.
- Notifying regulating agency(s), as appropriate.

### 4.1.3 Fire District

The Fire District is responsible for:

- Notifying appropriate personnel of the developing situation.
- Assessing the department's minimum resource needs to maintain operations.
- Evaluating potential safety issues and making recommendations to the Planning Section Chief.
- Provides communication resources and support as needed.
- Provides fire suppression personnel and equipment to support Public Works response and recovery activities.

### 4.1.4 Police Department

The Police Department is responsible for:

- Alerting personnel of developing conditions.
- Assessing the minimum resources needed by the department to maintain operations.
- Evaluating potential security and safety issues and making recommendations to the Planning Section Chief.
- Providing police personnel and equipment to support public works response and recovery activities.
- Providing communication resources and support as needed.

### 4.1.5 Private/Public Utilities

- Coordinating response activities with the City Public Works Department regarding restoration of services.
- Making repairs and restoring services as soon as possible.
- Supporting the City with equipment, personnel, etc., as appropriate.

# 5 Concept of Operations

When this Emergency Operations Plan (EOP) is activated, all activities and resources in support of infrastructure services will be coordinated by the City EOC staff as identified and managed using the Incident Command System (ICS). The City Public Works Department is the lead agency for infrastructure operations and solid waste (debris) management.

Public Works will focus on restoring vital lifeline systems to the community, with an emphasis on critical roads. Public Works will also place emphasis on supporting law enforcement, fire, and search and rescue with evacuation and traffic control capabilities. Other operational priorities will be:

- Damage assessment.
- Stabilization of damaged public and private structures to facilitate search and rescue and/or protect the public's health and safety.
- Identification and labeling of uninhabitable/unsafe structures.
- Coordination of the closure and repair of transportation infrastructure.
- Repair and restoration of damaged public systems (e.g., water, wastewater, and stormwater systems).
- Coordination with utility restoration operations (power, gas, telecommunications).
- Prioritization of efforts to restore, repair, and mitigate City- and County-owned infrastructure.

Public Works will use local contractors to supplement its emergency response capabilities, escalating unmet needs through the County EOC and/or mutual aid partners.

*See the Clackamas County EOP, Support Annex C – Damage Assessment for more detail.*

The County Transportation and Development division will address larger debris management issues for the County. If needed, the City would request the following infrastructure services from County Emergency Management:

- Identification and labeling of uninhabitable/unsafe structures.
- Establishment of priorities and processes for issuing demolition and building permits.
- Stabilization of damaged public and private structures to facilitate search and rescue and/or protect the public's health and safety.

- Development and designation of emergency collection, sorting, and debris routes and sites for debris clearance from public and private property.

# 6 City Infrastructure Services Functions

## 6.1 Transportation

- Monitor and report on the status of and damage to the transportation system and infrastructure because of an emergency incident.
- Identify temporary alternative transportation solutions that can be implemented.
- Coordinate with County and State transportation agencies to implement the restoration and recovery of transportation systems and infrastructure.

Transportation systems available in the City include:

- Sandy Area Metro – The City has a multi vehicle fleet used to provide local transit services. In the event of an emergency, the transit systemmay be able to provide vehicles for temporary shelters as available resources allow.

*See the Clackamas County EOP, ESF 1 – Transportation for more detail.*

## 6.2 Infrastructure Repair and Restoration

City Public Works actions may include:

- Conducting pre- and post-incident assessments of public works and infrastructure.
- Executing emergency contract support for lifesaving and life-sustaining services.
- Coordinating technical assistance, including engineering expertise, construction management, and contracting and real estate services.
- Providing emergency repair of damaged public infrastructure and critical facilities.

*See the Clackamas County EOP, ESF 3 – Public Works and Engineering for more detail.*

## 6.3 Energy and Utilities

Energy- and utility-related actions may include:

- Collecting, evaluating, and sharing information on energy/utility system damage and estimations of the impact of outages/failures within affected areas.
- Coordinating restoration of service in impacted areas.
- Ensuring backup power and utility sources for critical facilities.

*See the Clackamas County EOP, ESF 12 – Energy for more detail.*

### 6.4 Debris Management

City debris management activities will be coordinated by the City Public Works Department in coordination with the County Department of Public Works.

*See the Clackamas County EOP, Support Annex B – Debris Management for more detail.*

## 7 Supporting Plans and Procedures

- County Emergency Operations Plan
  - ESF 1 – Transportation
  - ESF 3 – Public Works and Engineering
  - ESF 12 – Energy
  - SA B – Debris Management
  - SA C – Damage Assessment
- County Resource Directory
- City of Sandy Natural Hazard Mitigation Plan (includes critical facilities and infrastructure list)

## 8 Appendices

None at this time.

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# 4 FA 4 – Recovery Strategy

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# Table of Contents

| FA 4 Tasked Agencies | |
|---|---|
| **Primary Agencies** | City Administration |
| **Supporting Agencies** | |

# 1 Purpose and Scope

The Recovery Strategy annex outlines the basic City services and resources necessary to recover from a disaster. Functions covered in the Recovery Strategy functional annex include:

- Damage Assessment
- Public Assistance
- Individual Assistance

# 2 Policies and Agreements

The following policies and agreements are currently in place to support recovery for the City:

- None at this time.

# 3 Situation and Assumptions

The recovery phase of an emergency is the period following the response period when actions are taken to help citizens return to a normal, or safer, life as soon as possible after an emergency.

Recovery is both a short- and long-term process. In the short term, emphasis is placed on restoring vital services to the community and identifying and providing basic needs to the public. Long-term recovery restores the community to its normal state, or better. It is at this point that knowledge gained by the incident is converted to mitigation measures for future hazard risks.

Local, County, and Federal government are responsible for assisting the public and private sector in disaster recovery. A widespread disaster may affect the functionality of business, disrupt employment, interrupt government services, and impact tax revenue. Recovery is an emergency management function undertaken during and after an event, along with the response. Expeditious recovery will limit costs, damages, and long-term impacts on the community. The purpose of this Recovery Strategy annex is to provide a strategy for the City to coordinate its recovery efforts with its partners at the State and Federal level.

In most cases, recovery begins during an event's response phase, when damage is identified and assessed. Damages are classified as being in the private or public sectors. The extent of damages in dollars will determine what, if any, State or Federal assistance may be available during the recovery phase. To request this assistance, a local proclamation of emergency must be made and communicated

to the Governor. Good record keeping and mitigation planning will support recovery efforts and ensure post-emergency compensation.

In addition to assistance available from governments, private non-profit organizations support recoveries as well. The American Red Cross and Salvation Army are examples of those involved in such efforts. The Governor can also request direct assistance from selected Federal agencies without a formal presidential declaration.

A comprehensive guide to Community Recovery in the State of Oregon can be found at the following internet site: http://www.oregon.gov/OMD/OEM/fin_rec/disaster_recover_guide.shtml.

# 4 Roles and Responsibilities

## 4.1 Emergency Operations Center Staff

During recovery, many of the Section Chiefs' responsibilities and activities continue, but sometimes with a change in focus, as outlined below.

### 4.1.1 Planning Section

- Demobilize resources.
- Document emergency activities.
- Providing situation status reports.
- Coordinate resource management with the Logistics Section and Incident Commander (IC).
- Provide maps of the area affected by an emergency or disaster.
- Perform the Initial Damage Assessment (IDA).

### 4.1.2 Logistics Section

- Make arrangements for a Disaster Recovery Center (DRC) for the Federal Emergency Management Agency (FEMA).
- Document emergency activities.
- Ensure temporary housing and feeding of displaced persons
- Coordinate resource management with the Planning and Finance Sections.

### 4.1.3 Finance Section

- Keep records of all costs incurred.

- Document emergency activities.

- Prepare documents for submission to State and Federal government.
- Provide Damage Assessment Coordination/Documentation.

### 4.1.4 Public Information Officer

- Disseminate public information.
- Document all emergency activities.

## 4.2 City Departments

### 4.2.1 City Administration

- Activate the disaster assessment team or process. Ensure that damage information is received from private non-profit organizations.
- Receive and compile disaster information to:
  - Share the information with the appropriate County and municipal agencies.
  - Prioritize response and recovery activities.
  - Determine if additional resources are needed.
  - Submit forms to County Emergency Management as needed.
- Coordinate with appropriate agencies to address unmet needs.
- Receive and disseminate information to decision makers to prioritize recovery efforts and determine the need for State or Federal assistance.
- Coordinate the involvement of community response partners regarding the Preliminary Damage Assessment (PDA) and disaster declaration process.
- Assist County, State, and Federal agencies with conducting Preliminary Damage Assessments.
- Ensure documentation of disaster-related response and recovery costs.
- Coordinate with local officials to identify and recommend mitigation projects.

### 4.2.2 Other City Agencies

- Assist with the damage assessment and disaster declaration process as requested.

- Document disaster-related response and recovery costs.
- Coordinate with local officials to identify and recommend mitigation projects.

# 5 Concept of Operations

## 5.1 Short-Term Recovery Activities

During the recovery phase of an emergency, the Emergency Manager or IC has the final authority to establish priorities for recovery activities and the allocation of resources to support them. Some activities, such as damage assessment, will most likely begin during the response phase of the emergency once the incident is stabilized. Short-term recovery activities may include:

- Assessing damage and posting notices of unsafe and unusable buildings, roads, or bridges.
- Assessing victims' needs.
- Removing disaster debris.
- Removing human and animal remains.
- Testing drinking water and, if necessary, establishing new or additional drinking water supplies.
- Performing emergency repairs of sanitary, sewer, and storm drainage systems.
- Repairing utility lines, e.g., electricity and natural gas.
- Establishing security in affected areas.

## 5.2 Long-Term Recovery Activities

Long-term recovery activities are generally conducted by the same resources used for similar activities during non-emergency times. These activities include:

- Restoring non-vital government services.
- Performing demolition and reconstruction of damaged areas.
- Monitoring restoration activities.
- Establishing, in coordination with the Federal government, a DRC *(See FA 2, Human Services for more detail*), if necessary.

- Identifying areas to improve and implement changes (such as building codes, emergency plans, training deficiencies, etc.) that could mitigate damage in future emergencies.

## 5.3 Requests for State and Federal Assistance

### 5.3.1 Local Emergency Declaration

When the City is faced with an emergency or disaster condition that requires a coordinated response beyond that which occurs routinely, and the required response is not achievable solely with the added resources acquired through mutual aid or cooperative assistance agreements, an emergency may be declared pursuant to SMC 2.80.

A local emergency declaration provides City officials with the additional authority that may be needed to address emergency conditions; can facilitate large-scale evacuations; and, once the appropriate response is beyond the capability of the County, can set the stage for requesting state assistance.

*See the Chapter 1 of the Basic Plan for procedures for declaring a state of emergency.*

### 5.3.2 Local Request for State Assistance

If an emergency has occurred wholly within the boundaries of the City, the request for assistance from the State must be submitted to the County for transmittal to Oregon Emergency Management (OEM) for consideration by the Governor. The State has a reasonable expectation that counties will endeavor to assist cities within their jurisdictions before turning to the State and/or Federal government for assistance.

Requests for assistance submitted to the County for transmittal to the State must include:

- The type of emergency or disaster.
- The location(s) affected.
- Deaths, injuries, population still at risk.
- The current emergency conditions or threat.
- An initial estimate of the damage and impacts.
- Actions taken and resources committed by local governments.
- Specific information about the assistance being requested.

### 5.3.3 County and Federal Recovery Efforts

Community recovery assistance from the County and Federal levels comes in the form of activating ESF 14 – Long-Term Community Recovery. This support function provides a mechanism for coordinating Federal support to State, Tribal, regional, and local governments, nongovernmental organizations, and the private sector to enable community recovery from the long-term consequences of extraordinary disasters. ESF 14 accomplishes this by identifying and facilitating availability and use of sources of recovery funding and by providing technical assistance for community recovery and recovery planning support. For information regarding County recovery procedures, refer to ESF 14 in the County EOP. For information at the Federal level, ESF 14 can be found at http://www.fema.gov/pdf/emergency/nrf/nrf-esf-14.pdf.

*NOTE: Detailed information on Local and State Recovery Processes is provided in the State Disaster Recovery Guidebook, Part I – Overview.*

# 6 City Recovery Functions

## 6.1 Damage Assessment

Damage assessment is conducted in two phases: initial damage assessment and secondary damage assessment. The initial assessment, a Planning Section responsibility, provides supporting information for the disaster declaration and is the responsibility of the City. The secondary damage assessment is an in-depth analysis of long-term effects and costs of the emergency and is performed with the combined efforts of local, State, and Federal agencies and the American Red Cross.

### 6.1.1 Windshield Surveys

During the initial phase of an event with widespread property damage (such as windstorm, earthquake, etc.) normal communication links may not exist. It is important to get an account of the damage as soon as possible to prioritize resource assignments.

As appropriate after an event, units from appropriate agencies may begin a process called “windshield surveys.”. Windshield Surveys consists of response agency units driving throughout the City in a systematic manner to survey predetermined high-priority facilities. When damage is discovered, a description of the situation is to be reported. The goal is to get a quick overview of the entire situation and then assign resources to the priority situations.

### 6.1.2 Initial Damage Assessment

During an emergency or disaster, local governments conduct a quick initial assessment of damages and impacts, sometimes as part of a request for State or Federal resources to augment local ones. The Emergency Manager coordinates

this assessment and usually assigns some Initial Damage Assessment responsibilities to other departments of local government.

The IDA evaluates the damages and costs related to a disaster, the impact of the disaster on the community, and which State, Federal, or volunteer agency programs might be appropriate for providing needed assistance. With respect to Federal assistance, a determination during the IDA of the extent of affected homes, businesses, and public facilities assists State officials in determining whether they need to follow up with other damage or impact assessments, including perhaps a PDA for Individual Assistance, Public Assistance, or both.

As soon as it can safely be done during or following the event, local officials should complete the IDA Summary Report Form and forward it to the County. The County should then forward the completed form to OEM.

Table RS-1 below outlines the City's priorities for damage assessment.

**Table RS-1 – City of Sandy Damage Assessment Priorities**

| **Priority #1** | **Public Safety and Restoration of Vital Services** |
|---|---|
| Emergency Operations | EOC<br>Fire District<br>Police Department facilities |
| Hazardous Industries | Hazardous occupancy industry<br>Natural gas pipelines<br>Electrical power stations and other like facilities |
| Utilities & Transportation Infrastructure | Sanitary sewer<br>Storm and water lines<br>Bridges and overpasses |
| Medical Facilities | Mass care and shelter facilities<br>Medical clinics |
| Other Vital Public Services | Schools and other public facilities<br>Food suppliers<br>Other major businesses |
| *Note: Each facility should be analyzed on structural integrity, safety, functional capability, and estimated costs to repair or replace.* | |
| **Priority #2** | **Assessment of Damage to Support Emergency or Major State or Emergency Declaration** |
| | Multi-family complexes<br>Single-family residences<br>Other businesses |

### 6.1.3 Secondary Damage Assessment

The initial damage assessment should provide the basis for subsequent assessment activities. Secondary Damage Assessments most often occur during the recovery

phase after initial response activities have taken place. Finance Section personnel should be able to perform the tasks outlined below.

- Identify damaged facilities and lead State and Federal damage assessment teams to them.
- Document expenditures in response to events for which a declaration has been requested. The State of Oregon standard for cost estimating is contained in the State Forestry Fire Plan. If the City can document actual costs, these should be used to develop accurate cost estimates.
- If the Finance Section is not staffed, the City Manager(or designee) will coordinate this activity.

The City Department of Public Works will provide personnel to lead damage assessment teams. Volunteers may be trained and can be expected to lead damage assessment teams for Priority #2 Initial Damage Assessments. Additional support may be available from the County.

*See the State Disaster Recovery Guidebook, Part I – Overview for more detailed information on damage assessment.*

## 6.2 Public Assistance

Requests for Public Assistance for the City will be coordinated with County Emergency Management.

### 6.2.1 Eligible Entities and Projects

Eligible applicants under the Public Assistance Program are units of local government, State agencies, organizations and agencies of native peoples, and private nonprofit organizations that meet certain criteria.

To be eligible for assistance, a project must result from a Presidentially declared emergency or major disaster, must lie within the designated disaster area, must be the responsibility of an eligible applicant, and must not fall within the authority of another Federal agency.

### 6.2.2 Request for Public Assistance

Applicants notify FEMA of their intent to apply for public assistance by filing a Request for Public Assistance (Request) form. The form outlines general information identifying the applicant, including the applicant's name, address, and primary and secondary contacts. If the applicant is unable to submit the Request to OEM at the Applicants' Briefing, the applicant must submit the form within 30 days of the date of designation of the County for Public Assistance. An applicant need not wait until all damage is identified before requesting assistance.

Federal and State personnel will review each Request to ensure applicant eligibility. Once a Request has been submitted, the project formulation process

can begin. Project formulation is the process of documenting the eligible facility, the eligible work, and the eligible cost for damaged projects.

### 6.3.3 Steps to Obtain Disaster Assistance

There are five primary steps to obtaining public disaster assistance:

1) A Request is submitted by the applicant.
2) A Public Assistance Coordinator (PAC) is assigned to each applicant.
3) The applicant presents a list of damages to the PAC at the Kickoff Meeting. This list is the basis for building Project Worksheets. The applicant then has 60 days from the date of the Kickoff Meeting to report or identify damages to FEMA.
4) The PAC and State staff work with the applicant/subgrantee to identify any special considerations, ensure that all damage and emergency work costs are identified, and that the scope-of-work on Project Worksheets is eligible and complete.
5) Upon approval of Project Worksheets, the funds are obligated to OEM, who is the grantee and will disburse Public Assistance funds to the subgrantee. Federal funds for small projects will be disbursed after approval, and Federal funds for large projects will be disbursed as work is accomplished.

*See the State Disaster Recovery Guidebook, Part IV – Programs Which Assist Public Agencies for more detailed information on public assistance.*

## 6.3 Individual Assistance

Individual Assistance programs strive to meet the disaster-related needs of individuals and families while utilizing disaster assistance resources as efficiently as possible. Disaster recovery officials especially strive to avoid duplication of benefits. Efficient use of recovery resources is also aided by providing assistance through a sequence of programs. Those with serious unmet disaster-related needs proceed through each step until all avenues, public and private, have been explored to meet those needs.

### 6.3.1 Insurance

Claims should be made in accordance with appropriate insurance policies in effect for the hazard that caused the disaster. Disaster assistance programs are not a replacement for proper insurance, nor can any disaster assistance program provide cost recovery for those affected by disaster as good as that provided by insurance. Moreover, most natural disasters that affect an individual or family are not widespread enough to result in the implementation of Federal disaster assistance programs. Hence, in most cases, insurance and voluntary agency assistance are the only avenues for helping families and individuals to recover.

### 6.3.2 Voluntary Agency Assistance

Many voluntary agencies provide disaster recovery assistance to individuals and families. Like insurance, voluntary agencies should be viewed as having resources that are utilized prior to governmental disaster assistance programs. In cases for which there is a Presidential declaration, access to some voluntary agency assistance may be gained at or through DRCs. Most voluntary agency assistance is intended to meet immediate disaster-related needs such as shelter, food, clothing, health and medical care (including counseling and mental health assistance), essential household furnishings, bedding, transportation, and sometimes temporary assistance to rent housing.

*See Appendix D – Typical Individual Assistance Programs for additional individual assistance programs.*

### 6.3.3 Disaster Recovery Centers

Local, State, and Federal entities will:

- If individual assistance is authorized, establish a local disaster recovery assistance center to assist qualified citizens with filing claims for financial or housing assistance.
- If public assistance is authorized, dispatch assessors to develop, in coordination with local representatives, disaster survey reports for public damage and response costs.
- Provide technical assistance and advice regarding recovery and mitigation activities to both citizens and public agencies, as appropriate.
- Coordinate public information and assistance activities with the EOC Public Information Officer and keep local authorities informed of assistance provided to residents, businesses, and local entities.

Identify and coordinate with State and Federal agencies regarding a location for the DRC.

*See the State Disaster Recovery Guidebook, Part II – Programs Which Assist Families and Individuals for more detailed information on individual assessment.*

# 7 Supporting Plans and Procedures

- County Emergency Operations Plan
  - ESF 14 – Long-Term Recovery
  - SA C – Damage Assessment
- State of Oregon Disaster Recovery Guidebook

# 8 Appendices

- Appendix A Damage Assessment Materials
  - A-1 Initial Damage Assessment Checklist
  - A-2 Preliminary Damage Assessment Checklist
  - A-3 Initial Damage Assessment Summary Report Form
- Appendix B Public Assistance Materials
- Appendix C Individual Assistance Materials
  - C-1 Disaster Recovery Center Requirements Checklist
  - C-2 FEMA DRC Requirements Worksheet
- Appendix D Typical Individual Assistance Programs

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# Appendix A Damage Assessment Materials

A-1 Initial Damage Assessment Checklist

A-2 Preliminary Damage Assessment Checklist

A-3 Initial Damage Assessment Summary Report Form

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## Appendix A-1 Initial Damage Assessment Checklist

As its name suggests, an IDA is meant to be an *initial* assessment of the damage and impacts caused by the disaster. Do not spend a great deal of time on details at this stage. The IDA only needs to outline enough damage and impacts to the community to bring in the right programs for a closer assessment.

All those using information obtained from an IDA should be cautioned concerning the limitations of the data and should expect variations between this initial assessment and the actual number of applications received should disaster assistance programs be offered.

### General

The following guidelines should be followed when conducting an IDA:

- Examine and note areas of major damage and damage that is likely to be expensive to repair and mitigate.
- Although insured losses should be noted, do not spend a great deal of time trying to collect detailed insurance information during the IDA. Determining the details of insurance in place is time consuming and unnecessary at this stage. If detailed insurance information is needed, it can be collected during a second assessment, such as the joint PDA.

  *Note: An exception to this rule is "small disasters," which require collecting insurance information during the IDA in order that the Small Business Administration can make a decision on whether or not to dispatch personnel to Oregon to lead a Small Business Administration (SBA) "damage survey."*
- The Individual Assistance IDA Field Data Collection Form is designed to assist you in conducting the IDA for homes and businesses.
- The Infrastructure (Public Assistance) IDA Data Collection Form may assist you in conducting the IDA for public sector damages.
- Analyze IDA data based on the following questions:
  - Is the damage such that only immediate personal needs (such as food, clothing, accommodation, and transport) exist? If so, these needs can probably be met by volunteer organizations such as the American Red Cross, Salvation Army, Mennonite Disaster Service, and others.
  - Is the damage primarily to the agricultural sector? If so, you may want to ask the State to request U.S. Department of Agriculture assistance.

- Are the impacts primarily to businesses that have suffered significant damage or other problems that would cause loss of revenue? If so, you may want to ask the state to investigate SBA programs.
- Is the damage primarily to homes? If so, perhaps the State should request SBA assistance or request an Individual Assistance joint PDA.
- Is the damage primarily to publicly owned facilities? If so, perhaps the State should request a Public Assistance joint PDA.

### Whom to Involve

Since speed and accuracy are essential in obtaining the maximum amount of information in the shortest amount of time, there should be more than one person involved in the IDA process. The Local Emergency Program Manager should assemble a team to assist, including members such as:

- American Red Cross officials: depending on the capabilities of the American Red Cross that serves your area, you may want to ask the American Red Cross to coordinate the IDA effort with respect to homes and to assess the number of persons significantly impacted by the disaster. In some cases, the American Red Cross will have already done so; you may be able to utilize information they have already gathered.
- Building inspectors and tax assessors from local governments, and appraisers from lending institutions or insurance companies, to evaluate buildings, manufactured homes, and businesses.
- City/County engineers, public works officials, utility officials, etc. for an assessment of damages to roads, bridges, other public facilities, and utility systems.
- Hospital and urgent care facility officials for information on injuries and fatalities.
- School district officials to provide school damage figures.
- County health officials for an assessment of disaster effects on community health.
- Officials in charge of levees, drainage systems, private nonprofit and recreational facilities, etc.
- County agent for farm and ranch damage assessment.

- Water Environmental Services
- Sunrise Water Authority

### Collecting Initial Damage Assessment Data by Telephone Bank

Local jurisdictions may want to establish a telephone bank to collect IDA information on damage and impacts to homes and businesses. If you decide to utilize the telephone bank approach, work with local media to reach affected individuals, families, and businesses. For each, try to collect at least the following:

- Name of individual, family, or business.
- Address of the damaged or impacted structure.
- Mailing address if different.
- Telephone numbers where the person reporting the damage or impacts can be reached.
- If the damaged structure is a home, is it a primary home or a second home? Is it a rental? If so, count the home twice: once as a home, a second time as a business. Try to obtain the appropriate points of contact for both.
- Is the loss/damage insured?
- Obtain a brief description of, and, if possible, estimated cost associated with the damage or impact; collect only enough information to allow you to categorize the damage as minor, major, or destroyed. Also note homes and businesses that are not damaged but that are directly impacted, such as loss of potable water, loss of septic system, loss of driveway access, etc. Homes meeting this criterion should be noted as "affected habitable"; businesses as "interrupted."

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## Appendix A-2 Preliminary Damage Assessment Checklist

To prepare for the arrival of State and Federal joint PDA officials, local jurisdictions should do as much of the following as time permits.

### General

- The Local Emergency Program Manager should coordinate the PDA or designate a PDA Coordinator. The person in this position should have a working knowledge of the PDA process and forms, and thorough familiarity with local geography, government officials, and public facilities.
- Line up appropriate officials who will become the local government representatives on the joint PDA teams. For Individual Assistance, consider assessors, building department inspectors, etc. For Public Assistance, consider building department inspectors, road department engineers and technicians, bridge engineers, etc.
- Prepare maps that note the locations and nature of the damage.
    - Delineate any areas where the damage is primarily to homes, businesses, and agricultural land.
    - Indicate the location of each damaged public facility and the government agency responsible for its care.
    - Mark the location of sites where disaster-related costs were incurred.
    - If possible, all damage sites should be identified by local officials before State/Federal inspectors arrive.
- On the same maps, indicate the best routes of travel, accounting for roads and bridges that are out of service due to the disaster, and methods for efficient routing such as travel "loops" likely to be taken by the joint PDA teams.
- Also on the maps, indicate areas where major utilities are still out of service, areas with septic tanks or wells, areas that are still experiencing the effects of the disaster, and health and safety hazards such as hazardous materials spills, biological hazards, downed power lines, etc.
- If possible, provide photographs of damage sites to State and Federal inspectors.
- Assemble and briefly summarize information on the resources committed by the jurisdiction in responding to the disaster. Be sure to

include the time commitment, overtime, etc. of City staff who have been involved.

- Ask everyone involved in the joint PDA to look for ways of rebuilding damaged structures to lessen damage and hardship next time; provide these ideas to the hazard mitigation PDA teams.
- Set up a joint PDA team support facility that includes:
  - Tables and chairs.
  - Displays, such as maps, chalk boards, dry erase boards, flip charts, bulletin boards, etc.
  - Telephones and telephone directories.
  - Copies of the Oregon Blue Book.
  - One or more photocopiers.
  - Availability of drinking water, coffee, etc.
  - Restrooms.
  - If available and appropriate, your EOC can serve as the joint PDA team support facility.
- Arrange for a facility to conduct the joint PDA public official and team briefings such as a courtroom, public auditorium,lecture hall, etc.
- Be prepared to provide high clearance vehicles for the use of the teams; these vehicles should be driven by the local representative and should comfortably seat up to five people.
- If necessary, assist State and Federal joint PDA team members to find lodging and meals during their stay in the disaster area.

### Individual Assistance

- Develop a written summary of the impacts of the disaster that answers the following questions:
  - Have there been injuries or deaths? Are persons missing?
  - Are families isolated due to the disaster?
  - Are public health and safety significantly compromised?
  - Is debris on private property a health and safety hazard? Does it prevent access to homes?

- Are services such as medical care, schools, mail delivery, public transportation, communication, etc. significantly affected?
- Are utilities out of service, e.g., electricity, gas, water, sewer, drainage systems, dikes, etc.? When will service be restored? Are outages widespread or concentrated in one area?
- Were many private vehicles destroyed?
- Is there increased unemployment due to the disaster?

■ Gather and assemble the following information about the area(s) affected by the disaster:

- Which affected areas are urban, suburban, or rural? Commercial? Industrial? Delineate these areas on the teams' maps.
- What was the area's economic base and condition prior to the disaster?
- What was the pre-disaster market value of homes in the disaster area(s)? Be prepared to provide dollar ranges to fit "high," "medium," and "low" categories.

■ Ask the American Red Cross to make available any information they have collected during their "windshield" and "on-site detailed" damage assessments.

■ Work with OEM and FEMA to obtain information regarding insurance coverage in the disaster areas. FEMA will conduct some of this research from their regional office.

■ What resources are available in the area to provide temporary housing for displaced persons? Vacant rental homes, mobile homes, or apartments?

■ If flooding occurred, make estimates for the team about water depths and velocities and the duration of flooding. Was the water contaminated with chemicals? Sewage? Other?

■ Assign local, State, Federal, and volunteer agency officials to each team; have each team cover both dwellings and businesses in a geographic area.

■ Dispatch teams to their areas; have each team report back into the central PDA support facility periodically by radio or telephone. Some teams may cover ground more quickly than others. If so, you may

want to reassign one or more geographic areas to a team or teams likely to finish before others.

### Public Assistance

- Develop a written description of the impacts of the disaster on local government, including:
  - Population served by the local government.
  - Budget balance before and after the disaster.
  - Capability of local government to deal with the interruption or loss of essential public services, continuing public health and safety problems, and the loss of public facilities, equipment, materials, etc.
  - Public service impacts that will continue without Federal assistance, including deferral of permanent repairs, reductions in ongoing services, delays in planned capital improvements, continued isolation of families or communities, etc.
- If the time the joint PDA will begin has been well established, go make appointments for the team at sites where the damage or the impact of the damage is greatest.
- In lieu of making appointments, develop a list of contacts for each damage site, including telephone numbers and times when they are easiest to reach.
- Ensure that local government representatives designated to serve on joint PDA teams have knowledge of repairs already made and repairs needing to be made, as well as a knowledge of the location of damage sites.
- Be prepared to provide State and Federal officials a detailed cost breakdown of labor, equipment, materials, and supplies for all completed work, including work completed through contracts with private-sector companies. While a variety of forms can be used to summarize these items, the format chosen must document “who, what, when, where, and how.”
- Be prepared to describe which sites will be repaired or reconstructed by contract, and those which will be repaired by local forces. If a contractor's estimate has been received, make it available to State and Federal inspectors.
- If damaged facilities are to be rebuilt to conform with new codes, specifications, or standards, be prepared to provide inspectors with

copies of the specifications, local resolutions, ordinances, etc. that are required in upgrading of the facilities.

- Time permitting: Using as many "Infrastructure (Public Assistance) IDA Field Data Collection Forms" as necessary, develop a list of work performed and facilities damaged as a direct result of the disaster. Estimate the cost of repair or restoration of damaged public facilities. Be sure to include both work that has been completed and that which has not. Organize the information by category-of-work.

- Assign local, State, and Federal officials to each team; have each team cover a geographic area.

- Dispatch the teams to their areas; have each team report back to the central PDA support facility periodically by radio or telephone. Some teams may cover ground more quickly than others. If so, you may want to reassign one or more geographic areas to a team or teams likely to finish before the others.

### Hazard Mitigation

- Think of the joint PDA as an opportunity to quickly identify hazard mitigation opportunities before much of the permanent repair work has been accomplished.

- Talk with the people who helped you to accomplish the IDA about any hazard mitigation opportunities they discovered during the IDA; provide this information to the State and Federal inspectors (FEMA and SBA).

- Resources permitting, assign a local representative to join FEMA and OEM hazard mitigation staff assigned to accomplish the hazard mitigation portion of the joint PDA. Assemble as many teams as appropriate and as resources permit; often, there will be only one hazard mitigation PDA team per local jurisdiction.

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## Appendix A-3 Initial Damage Assessment Summary Report Form

Electronic copies of the following damage assessment forms can be found at http://www.oregon.gov/OMD/OEM/fin_rec/section_b_form.shtml.

- Individual Assistance Initial Damage Assessment Field Data Collection Form
- Estimated Disaster Economic Injury Worksheet for Businesses
- Infrastructure (Public Assistance) Initial Damage Assessment Field Data Collection Form - Instructions for form are attached (Excel Spreadsheet)
- Individual Assistance IDA and PDA Calculation and Summary Form
- Initial Damage Assessment Summary Report Form (Excel Spreadsheet)
- Individual Assistance Joint PDA Team Assignments
- Joint Preliminary Damage Assessment (PDA) Individual Assistance Field Form (Adapted from FEMA Form 76-39)
- Public Assistance Preliminary Damage Assessment Site Estimate (Joint FEMA-OEM Form adapted from a FEMA Form)
- Public Assistance Preliminary Damage Assessment Summary (FEMA Form 90-80)

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# Appendix B Public Assistance Materials

Electronic copies of the following public assistance materials can be found at http://www.fema.gov/government/grant/pa/forms.shtm.

- Request for Public Assistance (FF90-49)
- Hazard Mitigation Proposal (FF90-61)
- Project Worksheet (FF90-91)
- PW-Damage Description and Scope of Work Continuation Sheet (FF90-91A)
- PW-Cost Estimate Continuation sheet (FF90-91B)
- PW-Maps and Sketches Sheet (FF90-91C)
- PW-Photo Sheet (FF90-91D)
- Validation Worksheet (FF90-118)
- Project Validation Form (FF90-119)
- Special Considerations Questionnaire (FF90-120)
- PNP Facility Questionnaire (FF90-121)
- Historic Review for Determination of Adverse Effect (FF90-122)
- Force Account Labor Summary Record (FF90-123)
- Materials Summary Record (FF90-124)
- Rented Equipment Summary Record (FF90-125)
- Contract Work Summary Record (FF90-126)
- Force Account Equipment Summary Record (FF90-127)
- Applicant's Benefit Calculation (FF90-128)

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## Appendix C Individual Assistance Materials

### C-1 Disaster Recovery Center Requirements Checklist

### C-2 FEMA DRC Requirements Worksheet

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## Appendix C-1 Disaster Recovery Center Requirements Checklist

### General Information

DRCs are sited only in jurisdictions where the need exists, and local officials request them. There is no State or Federal reimbursement for costs associated with use of the building selected (e.g., rent and utility costs).

Local officials must be willing to provide security at the facility during daily operations. DRCs may be open for as short as a few days and as long as a few weeks. Site selection for DRCs is a joint local, State, and Federal responsibility. This process is facilitated when local officials have prepared ahead of time and identified buildings that could serve as DRCs.

### Required

The following should be considered in identifying possible facilities to serve as DRCs:

- The building must be large enough for the needs of the situation (number of agencies and clients anticipated in the DRC). This may vary from as few as 1200 square feet to more than 4500 square feet. Consequently, it is advisable to identify a variety of buildings of different sizes in different locations within your jurisdiction.
- Sufficient tables and chairs for the needs of the situation should be readily available (in the facility, or easily moved to the facility). Each agency working at the facility will need at least one table and five chairs.
- The building must have heat, electricity, good lighting, potable water, rest rooms, and adequate parking.
- Appropriate emergency medical support should be quickly available to the building.
- Appropriate fire protection should be readily available.
- Access to and through the building must be barrier-free for disabled persons. (DRCs must meet Americans with Disabilities Act requirements and have a certification to that effect from the local building official on file prior to the disaster.)
- The building owner must be willing to allow FEMA and the SBA to install telephone lines.

### Preferred

- The public should generally be familiar with the building.
- The building should be proximate to most of the affected population. Travel time should be reasonable for most of the people affected by the disaster. Public transportation should be available, if possible.
- Custodial support should be available at the facility.
- An indoor waiting area near the entrance to the building is helpful.
- Bilingual support should be available, if appropriate.
- Childcare is a useful addition if it can be provided at the facility.
- Local officials should be prepared to help provide supplies, such as trash cans, writing pads, pencils, local telephone directories, maps of the disaster area(s), string, masking tape, etc.

## Appendix C-2 FEMA DRC Site Requirements List

**FEMA DRC SITE REQUIREMENTS WORKSHEET**

The following is the worksheet that FEMA uses to evaluate potential DRC facilities:

| | |
|---|---|
| **Date site evaluated:** | **Primary or secondary site (circle one)** |
| **Site address:** | **County name:** |
| **Site contact/telephone number:** | **City name:** |
| **After hours contact/telephone:** | **County E.M. Director/telephone:** |
| **Site accessible hrs:**<br>**days:** | Site keys: location and who has them? |

| DRC SITE REQUIREMENTS | YES/NO | COMMENTS |
|---|---|---|
| Proximate to affected area(s)? | | |
| Parking adequate? (preferably 40 spaces or more, but no fewer than 20 spaces) | | |
| Electricity, water, lighting adequate?<br>- adequate power available for fax machines and computers?<br>- water system functioning?<br>- emergency lighting system available?<br>- exterior lighting available? | | |
| Secure, safe, and sanitary facility?<br>- building sound, of good construction, and non-leaking condition?<br>- electric wiring in sound condition or sealed off from contact with staff and clients? (no exposed wiring - no missing receptacle cover plates or damaged receptacles)<br>- sprinkler system operating or fire extinguishers available?<br>- dry floors with no holes or other obstructions?<br>- heating and/or cooling system(s) verified as inspected and functioning properly?<br>- restrooms functional or portable units available?<br>- adequate ventilation of working area?<br>- can doors be locked?<br>- are windows secure?<br>- parking lot lighted/safe for staff and clients to walk to their cars? | | |
| Lease or use agreement? | | |
| Agreement between county/city officials? | | |
| Building is handicap accessible?<br>- adequate handicap parking?<br>- ramp for wheelchair (if necessary)?<br>- doorways wide enough to accommodate wheelchair?<br>- restrooms handicapped accessible, including wheelchair? | | |
| Space required: _____ (1,200 sq. ft. minimum) | | |
| Existing telephones available to FEMA? Number? | | |
| Incoming telephone cable capacity?<br>- number of pairs feeding the facility and cable type?<br>- pre-existing service and telephone or circuit numbers?<br>- contact local telephone company to verify availability of circuits to support minimum of 16 phone lines<br>- Verify that inside wiring can be easily accomplished. Existing cabling may not be reliable. Insure that access to areas including ceilings, telephone rooms, and crawl spaces is available. | | |
| Tables and chairs available to FEMA? Number?<br>(minimum 15 tables, 60-75 chairs) | | |
| Fax available to FEMA?<br>- number of faxes: _____<br>- make/model #: _____<br>(identify for each in comments) | | |
| Janitorial and trash pickup services? Frequency? | | |
| Crowd control devices such as ropes, cones, etc.? | | |

Oregon Emergency Management *Disaster Recovery Assistance Guidebook* 04-08-05
Disaster Recovery Center Requirements Checklist - 2

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## Appendix D – Typical Individual Assistance Programs

| Typical Individual Assistance Programs |
|---|
| **HUMANITARIAN SERVICE GROUPS**<br><br>(e.g., American Red Cross, Church Groups, Voluntary Organizations, Community Service Groups)<br><br>**Funded by:** Agency or group<br><br>**Administered by:** Agency or group at temporary or permanent locations<br><br>**Details:** These services can be requested by individuals or by local or state officials. Services provided include immediate emergency aid, such as clothing, food, medical assistance, shelter, cleanup help, transportation, furniture, and medical supplies |
| **EMERGENCY FOOD STAMP PROGRAM**<br><br>**Funded by:** Food and Nutrition Services (U.S. Department of Agriculture [USDA])<br><br>**Administered by:** State Department of Social and Health Services (DSHS)<br><br>**Details:** This program provides food coupons to qualified disaster victims. It requires a request to the USDA by the DSHS, based on request to the DSHS by State Emergency Management in coordination with local Emergency Management. |
| **INSURANCE ASSISTANCE**<br><br>**Administered by:** American Insurance Association, Federal Emergency Management Agency, and National Flood Insurance Program<br><br>**Details:** This program provides counseling regarding insurance problems or questions. |
| **CONSUMER PROTECTION**<br><br>**Administered by: State Attorney General's Office**<br><br>**Details:** This program provides counseling regarding consumer problems, such as non-availability of products and services needed for reconstruction, price gouging, and disreputable business concerns and practices. It may involve coordination with the Insurance Commissioner and/or legal counsel. |

## Typical Individual Assistance Programs

**CRISIS COUNSELING**

**Administered by:** Clackamas County Health, Housing and Human Services

**Details:** This program is available only after a special request by the Governor and approved by the Federal Emergency Management Agency. It provides referral services and short-term counseling for mental health problems caused or aggravated by a disaster.

**INDIVIDUAL AND FAMILY GRANT PROGRAM**

**Funded by:** 75% Federal, 25% State

**Administered by:** State Emergency Management

This program is intended to provide assistance to individuals and families to help them meet disaster-related necessary expenses and serious needs for which other assistance is either unavailable or inadequate. It is not intended as a replacement for an insurance program.

**TEMPORARY HOUSING PROGRAM**

**Funded by:** 100% Federal

**Administered by:** Federal Emergency Management Agency

**Details:** This program provides financial assistance or government-owned dwellings, if available, for those whose primary residences are uninhabitable due to a disaster.

**DISASTER LOANS**

**Funded by:** U.S. Small Business Administration

**Administered by:** U.S. Small Business Administration

**Physical Disaster Loans -** Low-interest loans to individuals for repair, replacement, or rehabilitation of owner-occupied primary residences or personal property loss for renters.

**Business Loans (Physical Disaster Loans) -** Low-interest loans to businesses for repair, replacement, or rehabilitation of disaster-damaged property.

**Economic Injury Disaster Loans** - For businesses suffering economic loss as a result of a single sudden physical event of catastrophic nature. The Small Business Administration's maximum loan is $500,000. Funds can be used for indebtedness and operating expenses.

| Typical Individual Assistance Programs |
|---|
| **EMERGENCY LOANS, FARMERS HOME ADMINISTRATION**<br><br>**Administered by:** U.S. Department of Agriculture<br><br>**Details:** This program provides low-interest loans to farmers, ranchers, and agricultural operators (either tenant-operator or owner-operator) for physical and production losses. Loans may also be used to repair or replace farm property and supplies or for repayment of farm operating debts incurred during the disaster year. Loans may also be available if approved by the USDA, following a governor's request. |
| **DISASTER UNEMPLOYMENT ASSISTANCE**<br><br>**Funded by:** Federal Emergency Management Agency<br><br>**Administered by:** U.S. Department of Labor through the State Employment Security Department<br><br>**Details:** This program provides weekly benefit payments to those out of work due to a disaster, including self-employed persons, farm workers, farm and ranch owners, and others not normally covered under regular unemployment insurance programs. |
| **TAX ASSISTANCE**<br><br>**Administered by:** Internal Revenue Service and Tax Information for Indian Tribal Governments<br><br>**Details:** This program provides counseling and assistance in the form of income tax rebates to disaster victims who file income tax returns during the year of the disaster or during any of the three previous years. These earlier returns may be amended to receive an immediate tax rebate for non-insured casualty losses to homes, personal property, businesses, or farming/ranching operations. Benefits may also result from filing amended state income tax returns. |
| **SOCIAL SECURITY BENEFITS**<br><br>**Funded by:** Social Security Administration<br><br>**Administered by:** Social Security Administration<br><br>**Details:** This program provides assistance to annuitants with address changes and expedited check delivery. Assistance in applying for disability, death, survivor benefits, and Social Security Insurance payments. |

| Typical Individual Assistance Programs |
| --- |
| **VETERAN'S BENEFITS**<br><br>**Funded by:** Veterans Administration (VA)<br><br>**Administered by:** Veterans Administration<br><br>**Details:** This program provides assistance in applying for VA death benefits, pensions, insurance settlements, and adjustments to VA-insured home mortgages. VA representatives will also record address changes, if necessary. |
| **LEGAL SERVICES**<br><br>**Administered by:** Federal Emergency Management Agency<br><br>**Details:** This program provides free legal counseling to low-income persons for disaster-related problems. May include replacing legal documents, transferring titles, contracting problems, will probates, and insurance problems. |

# 1 IA 1 – Earthquakes/ Seismic Activity

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NOTE: This annex also includes landslides as a secondary hazard.

An earthquake of 5 or greater on the Richter Scale may or may not cause widespread damage, but either way it is a situation that would warrant activating the EOC to better coordinate the flow of information and damage assessment.

Initially, the lead agencies for earthquake response will be the Sheriff's Department and the Fire Service. After the initial assessment to determine the extent of damage, injury, and loss of life has been accomplished, the ICS/Operations section lead may transition to the fire service. As emergency response transitions from rescuing casualties to recovery of deceased victims, the Road Department may be expected to assume the role of lead department in the ICS/Operations section for the City's earthquake response. The Road Department's efforts in this response and early recovery phase of the disaster are likely to concentrate on reestablishing public infrastructure facilities.

## Earthquake/Seismic Activity Checklist

| Phase of Activity | Action Items | Supplemental Information |
|---|---|---|
| PRE-INCIDENT PHASE | ☐ Continue to maintain and revise, as needed, applicable response plans pertaining to earthquakes and other seismic activity, including the EOP and supporting procedures and plans. | |
| | ☐ Pre-designate evacuation routes and alternate routes for areas vulnerable to earthquakes. | |
| | ☐ Conduct pre-incident planning for sheltering and evacuation related to earthquakes. | |
| | - Prepare map(s) and script to be used on local television station(s) for emergency broadcast. Include release instructions. | |
| | - Prepare radio messaging to be used by local radio stations for emergency broadcast. | |
| | ☐ Have personnel participate in necessary training and exercises, as needed. | |
| | ☐ Participate in earthquake preparedness activities, seeking understanding of interactions with participating agencies in an earthquake scenario. | |
| | ☐ Ensure that emergency contact lists are updated, and establish a pre-event duty roster allowing for 24/7 operational support for the County and City EOCs. | |
| | ☐ Ensure that earthquake response equipment and personnel inventories are updated. Test and maintain response and communications equipment. Keep a stock of necessary response supplies. | |
| | ☐ Inform the Emergency Management Director of any major developments that could adversely affect response operations (e.g., personnel shortages, loss of firefighting equipment, etc.). | |
| | ☐ Work with the planning department and local planning commissions to establish appropriate infrastructure protection measures in landslide-prone areas. | |
| | - Implement seismic inspection procedures on a regular basis and incorporate improvements to structures, while also updating appropriate mitigation plans. | |

# Earthquake/Seismic Activity Checklist

| Phase of Activity | Action Items | Supplemental Information |
|---|---|---|
| | ☐ Provide public safety information and educational programs regarding emergency preparedness and response. | |
| RESPONSE PHASE | ☐ Activate the EOP when earthquake and/or seismic incidents pose threats. | |
| | ☐ Activate the appropriate EOCs and establish Incident Command. For larger events that cross multiple jurisdictions, establish a Unified Command. The City and/or the County EOC may be staffed. Staffing levels vary with the complexity and needs of the response. At a minimum, the IC, all Section Chiefs, the Resource Coordinator, and management support positions will most likely be needed. | |
| | ☐ Estimate emergency staffing levels and request personnel support. | |
| | ☐ Ensure that action is taken to protect personnel and emergency equipment from possible damage by earthquake, remaining cognizant of aftershocks. | |
| | ☐ Develop work assignments for ICS positions (*recurring).* | *ICS Form 203: Organization Assignment List* |
| | ☐ Notify supporting agencies. | |
| | - Identify local, regional, State, and Federal agencies/entities that may be able to mobilize resources to support local response efforts and EOC staffing. | |
| | ☐ Determine the type, scope, and extent of the incident (*recurring).* Verify reports and obtain estimates of the area that may be affected. Obtain information regarding status of impacts within the jurisdiction. | *ICS Form 209: Incident Status Summary.* |
| | - Notify command staff, support agencies, adjacent jurisdictions, ESF leads/coordinators, and liaisons of any situational changes. | |
| | ☐ Develop and initiate shift rotation plans, including briefing of replacements during shift changes. | |
| | - Dedicate time during each shift to preparing for shift change briefings. | *Incident Action Plan* |
| | ☐ Confirm or establish communications links among local and County EOCs, other Agency Operations Centers, and the State ECC. Confirm operable phone numbers and verify functionality of alternate communications resources. | |
| | ☐ Ensure that all required notifications have been completed. Consider other local, regional, Tribal, State, and Federal agencies/entities that may be affected by the incident. Notify them of the status. | *Established emergency contact lists maintained at the EOC* |
| | ☐ Manage and coordinate interagency functions. Providing multi-agency coordination is the primary goal. Assimilate into a Unified Command structure if the scope of the incident so dictates. | |
| | ☐ Implement local plans and procedures for earthquake operations. Ensure that copies of all documents are available to response personnel. Implement agency-specific protocols and SOPs. | *Local, agency, and facility-specific Standard Operating Procedures* |
| | ☐ Conduct and obtain current damage reports and determine the affected area (*recurring).* | |

# Earthquake/Seismic Activity Checklist

| Phase of Activity | Action Items | Supplemental Information |
|---|---|---|
| | ☐ Determine the need to conduct evacuations and sheltering activities (*recurring)*. Evacuation activities will be coordinated among County ESF 1 – Transportation, ESF 5 – Emergency Management, ESF 6 – Mass Care, Housing, and Human Services, and ESF 15 – Public Information and External Affairs. | |
| | ☐ Determine the need for additional resources and request them as necessary through appropriate channels (*recurring)*. | |
| | ☐ Submit a request for emergency/disaster declaration, as applicable. | |
| | ☐ Activate mutual aid agreements. Activation includes placing backup teams on standby and alerting resource suppliers of both potential and current needs. | |
| | ☐ Coordinate resource access, deployment, and storage in the operational area. Resources to coordinate include equipment, personnel, facilities, supplies, procedures, and communications. Track resources as they are dispatched and/or used. | *ICS Resource Tracking Forms* |
| | ☐ Develop plans and procedures for registering mutual aid and other first responders as they arrive on the scene and receive deployment orders. | |
| | ☐ Establish a JIC and designate a lead PIO for the jurisdiction. | |
| | ☐ Formulate emergency public information messages and media responses utilizing "one message, many voices" concepts (*recurring)*. | |
| | - Public information will be reviewed by the IC (or designee). Information will be approved for release by the IC and lead PIO prior to dissemination to the public. | |
| | ☐ Record all EOC and individual personnel activities (*recurring)*. All assignments, person(s) responsible, and actions taken should be documented in logbooks. | *EOC Planning Section job action guide, ICS Form 214 – Unit Log* |
| | ☐ Record all incoming and outgoing messages (*recurring*). All messages, and the names of those sending and receiving them, should be documented as part of the EOC log. | |
| | ☐ Develop and deliver situation reports (*recurring*). At regular intervals, the IC/EOC Manager and staff will assemble a situation report. | |
| | ☐ Develop and update the IAP (*recurring*). This document is developed by the Planning Section and approved by the IC. The IAP should be discussed at regular intervals and modified as the situation changes. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Implement objectives and tasks outlined in the IAP (*recurring*). | |
| | ☐ Coordinate with private sector partners, as needed. | |
| | ☐ Ensure that all reports of injuries, deaths, and major equipment damage accrued during response activities are communicated to the IC and/or the Safety Officer. | |

# Earthquake/Seismic Activity Checklist

| Phase of Activity | Action Items | Supplemental Information |
|---|---|---|
| RECOVERY/ DEMOBILIZATION PHASE | ☐ Ensure an orderly demobilization of emergency operations in accordance with current demobilization plans. | |
| | ☐ Once the threat to public safety is eliminated, conduct and/or coordinate cleanup and recovery operations. | |
| | ☐ Activate, if necessary, the appropriate recovery strategies and COOP/COG plans. | |
| | ☐ Release mutual aid resources as soon as possible. | |
| | ☐ Conduct a post-event debriefing to identify success stories, opportunities for improvement, and development of the After Action Report/Improvement Plan. | |
| | ☐ Deactivate/demobilize EOCs, Agency Operations Centers, and command posts. | |
| | ☐ Correct any response deficiencies reflected in the Improvement Plan. | |
| | ☐ Revise any applicable emergency response plans based on the success stories and/or lessons learned during the response. | |
| | ☐ Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov) | |

# 2 IA 2 – Severe Weather (including Landslides)

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| Severe Weather Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **PRE-INCIDENT PHASE** | ☐ Continue to maintain and revise, as needed, applicable response plans pertaining to severe weather and landslides, including the City EOP and supporting procedures/plans. | |
| | ☐ Monitor weather and flood reports. | |
| | ☐ Pre-designate evacuation routes and alternate routes for areas vulnerable to landslides or other hazards relating to severe weather. | |
| | ☐ Conduct pre-incident planning for sheltering and evacuation related to severe weather and landslides. | |
| | ▪ Prepare map(s) and scripts for use by local television station(s) during emergency broadcasts. Include release instructions. | |
| | ▪ Prepare radio messages for use by local radio stations during emergency broadcasts. Include release instructions. | |
| | ☐ Have personnel participate in necessary training and exercises, as determined by City Emergency Management in coordination with lead agencies and coordinators. | |
| | ☐ Participate in City and County severe weather and landslide preparedness activities, seeking understanding of interactions with participating agencies in a severe weather scenario. | |
| | ☐ Ensure that emergency contact lists are updated and establish a pre-event duty roster allowing for 24/7 operational support for the City EOC. | |
| | ☐ Ensure that landslide and flood response equipment and personnel inventories are current for the City. Test and maintain response and communications equipment. Keep a stock of necessary response supplies. | |
| | ☐ Inform City and County Emergency Management of any major developments that could adversely affect response operations (e.g., personnel shortages, loss of firefighting equipment, etc.). | |
| | ☐ Work with the County planning department to establish appropriate infrastructure protection measures in landslide/flood-prone areas. | |
| | ☐ Provide public safety information and educational programs regarding emergency preparedness and response. | |

## IA 2. Severe Weather (including Landslides)

| Severe Weather Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **RESPONSE PHASE** | ☐ Activate the City EOP when severe weather and/or landslides incidents pose threats to the City. | |
| | ☐ Activate the appropriate EOCs and establish Incident Command. For larger events that cross multiple jurisdictions, establish a Unified Command. City and/or County EOCs may be staffed. Staffing levels vary with the complexity and needs of the response. At a minimum, the IC, all Section Chiefs, the Resource Coordinator, and management support positions will most likely be needed. | *FA 1 of the City EOP* |
| | ☐ Estimate emergency staffing levels and request personnel support. | |
| | ☐ Ensure that action is taken to protect personnel and emergency equipment from possible damage by severe weather, landslides, or floodwaters. | |
| | ☐ Develop work assignments for ICS positions (recurring). | *ICS Form 203: Organization Assignment List* |
| | ☐ Notify supporting agencies as well as the Mayor and City Council. | |
| | ▪ Identify local, County, and regional agencies/entities that may be able to mobilize resources to support local response efforts and EOC staffing. | |
| | ☐ Determine the type, scope, and extent of the incident (recurring). Verify reports and obtain estimates of the area that may be affected. Obtain status of impacts within the City. | *ICS Form 209: Incident Status Summary* |
| | ▪ Notify command staff, support agencies, adjacent jurisdictions, agency leads/coordinators, and liaisons of any situational changes. | |
| | ☐ Develop and initiate shift rotation plans, including briefing of replacements during shift changes. | |
| | ▪ Dedicate time during each shift to preparing for shift change briefings. | *Incident Action Plan* |
| | ☐ Confirm or establish communications links among local and County EOCs and other Agency Operations Centers. Confirm operable phone numbers and verify the functionality of alternate communications resources. | *FA 1 of the City EOP* |

| Severe Weather Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Ensure that all required notifications have been completed. Consider other local, County, and regional agencies/entities that may be affected by the incident. Notify them of the status. | *Established emergency contact lists maintained at the EOC* |
| | ☐ Manage and coordinate interagency functions. Providing multi-agency coordination is the primary goal. Assimilate into a Unified Command structure if the scope of the incident so dictates. | |
| | ☐ Implement local plans and procedures for severe weather, landslide, and/or flood operations. Ensure that copies of all documents are available to response personnel. Implement agency-specific protocols and SOPs. | *Local, agency, and facility-specific SOPs* |
| | ☐ Obtain current and forecasted weather to project potential damage and determine the affected area (recurring). | |
| | ☐ Determine the need to conduct evacuations and sheltering activities (recurring). | *FA1 of the City EOP* |
| | ☐ Determine the need for additional resources and request them as necessary through appropriate channels (recurring). | *FA 1 of the City EOP* |
| | ☐ Submit a request for an emergency/disaster declaration, as applicable. | *Section 1 of the City EOP* |
| | ☐ Activate mutual aid agreements. Activation includes placing backup teams on standby and alerting resource suppliers of both potential and current needs. | |
| | ☐ Coordinate resource access, deployment, and storage in the operational area. Resources to coordinate include equipment, personnel, facilities, supplies, procedures, and communications. Track resources as they are dispatched and/or used. | *ICS Resource Tracking Forms; FA 1 of the City EOP* |
| | ☐ Develop plans and procedures for registering mutual aid and other first responders as they arrive on the scene and receive deployment orders. | |
| | ☐ Establish a JIC and designate a lead PIO for the City. | *FA 1 of the City EOP* |
| | ☐ Formulate emergency public information messages and media responses utilizing “one message, many voices” concepts (recurring). | |

| Severe Weather Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Public information will be reviewed by the IC (or designee). Information will be approved for release by the IC and Lead PIO before dissemination to the public. | *FA 1 of the City EOP* |
| | ☐ Record all EOC and individual personnel activities (recurring). All assignments, person(s) responsible, and actions taken should be documented in logbooks. | *EOC Planning Section job action guide, ICS Form 214 – Unit Log* |
| | ☐ Record all incoming and outgoing messages (recurring). All messages, and the names of those sending and receiving them, should be documented as part of the EOC log. | |
| | ☐ Develop situation reports (recurring). At regular intervals, the EOC Director and staff will assemble a situation report. | |
| | ☐ Develop and update the IAP (recurring). This document is developed by the Planning Section and approved by the IC. The IAP should be discussed at regular intervals and modified as the situation changes. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Implement objectives and tasks outlined in the IAP (recurring). | |
| | ☐ Coordinate with private sector partners as needed. | |
| | ☐ Ensure that all reports of injuries, deaths, and major equipment damage accrued during response activities are communicated to the IC and/or the Safety Officer. | |
| **RECOVERY/DEMOBILIZATION PHASE** | ☐ Ensure an orderly demobilization of emergency operations in accordance with current demobilization plans. | |
| | ☐ Once the threat to public safety is eliminated, conduct cleanup and recovery operations. | |
| | ☐ Activate, if necessary, the appropriate recovery strategies, continuity of operations plans, and/or continuity of government plans. | *FA 1 of the City EOP* |
| | ☐ Release mutual aid resources as soon as possible. | |
| | ☐ Conduct a post-event debriefing to identify success stories, opportunities for improvement, and development of the After Action Report/Improvement Plan. | |

| Severe Weather Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Deactivate/demobilize the EOCs, Agency Operations Centers, and command posts. | |
| | ☐ Correct any response deficiencies reflected in the Improvement Plan. | |
| | ☐ Revise any applicable emergency response plans based on the success stories and/or lessons learned during the response. | |
| | ☐ Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov) | |

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# 3 IA 3 – Hazardous Materials (Accidental Release)

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## IA 3. Hazardous Materials (Accidental Release)

| Hazardous Materials Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **PRE-INCIDENT PHASE** | ☐ Have personnel participate in necessary training and exercises, as determined by City Emergency Management, the Fire Protection District, and the County ESF 10 Lead. | |
| | ☐ Participate in City and County preparedness activities, seeking understanding of interactions with participating agencies in HazMat scenarios. | |
| | ☐ Ensure that emergency contacts lists are updated and establish a pre-event duty roster allowing for 24/7 operational support for the City EOC. | |
| | ☐ Inform City Emergency Management of any major developments that could adversely affect response operations (e.g., personnel shortages, loss of equipment, etc.). | |
| **RESPONSE PHASE** | ☐ In most incidents, the local fire district will initially respond, assume initial IC responsibilities, and request activation/deployment of the HazMat Team. | *FA 1 of the City EOP* |
| | ☐ Determine the type, scope, and extent of the HazMat incident (*recurring).* Verify reports and obtain estimates of the area that may be affected. | *ICS Form 209: Incident Status Summary* |
| | ▪ Notify 911 dispatch, support agencies, adjacent jurisdictions, ESF coordinators, and liaisons of the situation. | |
| | ▪ Assess the type, severity, and size of the incident. If possible, characterize the hazardous material(s) of concern and determine appropriate personal protection equipment requirements. | |
| | ▪ Ensure that a health and safety plan is developed by the designated Safety Officer, including monitoring first responders in accordance with all applicable guidance. | |
| | ☐ Provide support for implementation of applicable Geographic Response Plans established by the Oregon Department of Environmental Quality to guide activities throughout the duration of the incident. | *Northwest Area Contingency Plan (NWACP)* |
| | ☐ Ensure that proper containment methods have been implemented by the first responders until HazMat response teams arrive. | |
| | ☐ Establish access control to the incident site through local law enforcement agencies. | |

| Hazardous Materials Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ If the situation warrants, request activation of the City or County EOCs via the IC through the City Manager. | *FA 1 of the City EOP* |
| | ☐ Activate the City EOC, coordinate response activities among Agency Operations Centers and Incident Command Posts, and establish IC or UC as appropriate. Staffing levels vary with the complexity and needs of the response. At a minimum, the IC, all Section Chiefs, the Resource Coordinator, and management support positions may be necessary. | *FA 1 of the City EOP* |
| | ☐ If applicable, establish immediate gross decontamination capability for victims. | |
| | ☐ Estimate emergency staffing levels and request personnel support. | |
| | ☐ Develop work assignments for ICS positions (*recurring*). | |
| | ☐ Notify HazMat supporting agencies. | *FA 1 of the City EOP* |
| | ▪ Identify local, regional, and/or State agencies that may be able to mobilize resources to the City EOC for support. | |
| | ☐ Contact OERS at 1-800-452-0311 for technical assistance and support in requesting the regional HazMat Team. *Note: The primary regional HazMat response team is located in Salem.* | *OERS is available 24 hours a day.* |
| | ☐ Assign liaisons to the City EOC representing government agencies, private entities (e.g., railroad companies, chemical manufacturers, etc.), and other stakeholders. | |
| | ☐ Develop and initiate shift rotation plans, including briefing of replacements during shift changes. | |
| | ▪ Dedicate time during each shift to prepare for shift change briefings. | *Incident Action Plan* |
| | ☐ Confirm or establish communications links among primary and support agencies, the City EOC, County EOC, and the State ECC. Confirm operable phone numbers and backup communication links. | *FA 1 of the City EOP* |
| | ☐ Ensure that all required notifications have been completed. Consider other local, State, and Federal agencies that may be affected by the incident. Notify them of the status. | *FA 1 of the City EOP; Established emergency contact lists maintained at the City EOC* |

| Hazardous Materials Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ▪ For incidents occurring on State highways, ensure that ODOT has been notified. | |
| | ▪ Contact appropriate key stakeholders and partners if the incident poses an actual or potential threat to State parks, recreational areas, historical sites, environmentally sensitive areas, tourist routes, or other designated areas. | |
| | ▪ If agricultural areas and livestock are potentially exposed or impacted, notify local extension services (Oregon State University), the Oregon Department of Agriculture, and the State Veterinarian. | *ESF 11 Annex of the County EOP* |
| | ☐ A lead PIO will be designated by the City Manager. The PIO will issue information individually or through the JIC, if established, in coordination with appropriate local, regional, and State agencies. | *FA 1 of the City EOP* |
| | ☐ Manage and coordinate interagency functions. Providing multi-agency coordination is the primary goal. Assimilate into a UC structure, as dictated by incident. | |
| | ☐ Implement local plans and procedures for HazMat operations. Implement agency-specific protocols and SOPs. Ensure that copies of all documents are available to response personnel. | *FA 1 of the City EOP* |
| | ▪ For responses requiring assistance from the Oregon DEQ Regional Response Team, refer to the Geographic Response Plan applicable to the incident site and support procedures according to the Northwest Area Contingency Plan. | |
| | ☐ Obtain current and forecasted weather to project potential spread of the plume (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Based upon the incident's size, type of chemical/substance, and weather projections, establish a safe zone and determine a location for an on-site staging and decontamination. Re-evaluate as the situation changes. | |
| | ☐ Determine the need for implementing evacuation and sheltering activities (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Establish a victim decontamination and treatment area(s). | |

| Hazardous Materials Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Determine the need for additional resources and request them as necessary through appropriate channels (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Submit a request for emergency/disaster declaration, as applicable. | *Section 1.4.2 of the City EOP* |
| | ☐ Activate mutual aid agreements. Activation includes placing backup teams on standby and alerting resource suppliers of both potential and current needs. | |
| | ☐ Coordinate resource access, deployment, and storage in the operational area. Resources to coordinate include equipment, personnel, facilities, supplies, procedures, and communications. Track resources as they are dispatched and/or used. | *ICS Resource Tracking Forms, FA 1 of the City EOP* |
| | ☐ Develop plans and procedures for registering regional HazMat teams as they arrive on the scene and receive deployment orders. | |
| | ☐ Establish the JIC, as needed. | *FA 1 of the City EOP* |
| | ☐ Formulate emergency public information messages and media responses using "one message, many voices" concepts *(recurring).* | *FA 1 of the City EOP* |
| | ▪ Public information will be reviewed and approved for release by the IC and the lead PIO before dissemination to the public and/or media partners. | |
| | ☐ Record all EOC and individual personnel activities (*recurring).* All assignments, person(s) responsible, and significant actions taken should be documented in logbooks. | *EOC Planning Section job action guide, ICS Form 214 – Unit Log* |
| | ☐ Record all incoming and outgoing messages (*recurring*). All messages and names of those sending and receiving them should be documented as part of the EOC log. | |
| | ☐ Develop and deliver situation reports (*recurring*). At regular intervals the IC/EOC Director and staff will assemble a Situation Report. | |

| Hazardous Materials Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Develop an IAP (*recurring*). This document is developed by the Planning Section and approved by the IC. The IAP should be discussed at regular intervals and modified as the situation changes. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Implement objectives and tasks outlined in the IAP (*recurring*). | |
| | ☐ Coordinate with private sector partners, as needed. | |
| | ☐ Ensure that all reports of injuries, deaths, and major equipment damage due to HazMat incidents are communicated to the IC and/or Safety Officer. | |
| | ☐ As applicable, clean-up activities will most likely be conducted by private contractors and coordinated among the City EOC, the responsible party (if known), and the Oregon Department of Environmental Quality. | |
| **RECOVERY/ DEMOBILIZATION PHASE** | ☐ Ensure an orderly demobilization of emergency operations, in accordance with current demobilization plans. | *FA 1 of the City EOP* |
| | ☐ Consider long-term environmental decontamination and remediation needs and coordinate tasks with the appropriate State agencies and/or private sector partners. | |
| | ☐ Release mutual aid resources as soon as possible. | |
| | ☐ Conduct a post-event debriefing to identify success stories, opportunities for improvement, and development of the After Action Report/Improvement Plan. | |
| | ☐ Deactivate/demobilize the City EOC. | |
| | ☐ Correct any response deficiencies reflected in the Improvement Plan. | |
| | ☐ Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov) | |

## Appendix A Hazardous Materials Sites

The following locations use, store, or produce hazardous materials:

- Fuel Storage
  - Space Age
  - Fred Meyer
  - Chevron
  - Leathers Oil Co.
  - Mt. Hood Arco (East and West)
  - Pacific Pride Fuel
  - Sandy Market and Shell
  - Amerigas
  - Sandy BP 76 Station
  - Shorty's*
  - Quality Tank
- Advanced Auto Parts
- Ace Heritage Hardware
- Advanced Plastics, Inc
- Bill's Automotive
- Hearth Classics
- Jiffy Lube
- Les Schwab Tire Center
- Champion Collision
- NAPA Auto Parts
- Performance Auto Body*
- Iseli Nursery*
- Sandy Auto Body
- O'Reilly Auto Parts

- Mt. Hood Cleaners and Laundry
- Sandy Funeral Home
- Sandy Stone and Brick
- Ever Fresh Fruit*
- The Maiden Foundry
- Sandy Farms*
- Sandy Fish Hatchery – Oregon Fish and Wildlife*
- Waste Management*
- Suburban Ford
- Suburban Chevrolet
- Student Transportation of America (STA)
- Web Steel
- US Metal
- Sandy ODOT*

** Assets outside of Sandy city limits but within the fire district. Emergency first responders attend to calls in these areas outside city limits.*

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# 4 IA 4 – Flood (Including Dam Failure)

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| Flood Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **PRE-INCIDENT PHASE** | ☐ Arrange for personnel to participate in necessary training and develop exercises relative to flood events. | |
| | ☐ Coordinate the City's preparedness activities, seeking understanding of interactions with participating agencies in flooding scenarios. | |
| | ☐ Ensure that emergency contact lists are updated and establish a pre-event duty roster allowing for 24/7 operational support to the City EOC. | |
| | ☐ Contact supporting emergency response agencies to review and determine whether major developments have arisen that could adversely affect response operations (e.g., personnel shortages, loss of equipment, etc.). | |
| | ☐ Annually review and update the EOP and SOPs, as needed. | *City EOP, Annexes, and agency-specific SOPs* |
| | ☐ Review flood prone areas. | |
| | ☐ Familiarize staff with requirements for requesting State and Federal Disaster Assistance. | *Stafford Act, FEMA guidance, and Oregon EMP* |
| | ☐ Ensure that supplies, such as communications devices and sandbags, are prepared and ready for use. This includes primary and alternate communications and warning systems. | *FA 1 of the City EOP* |
| | ☐ Identify and review local contractor lists to see who may provide support specific to flood response. | |
| | ☐ Review, revise, and, where necessary, establish mutual aid agreements with other City agencies and private contractors relative to multiple agency response to floods. | |
| **RESPONSE PHASE** | ☐ The City Manager will provide overall guidance for the deployment of resources. | |
| | ☐ Activate mutual aid agreements. | |
| | ☐ Activate the City EOC and implement appropriate staffing plans. Contact appropriate private partners to assign liaisons to the EOC for coordination of specific response activities. | *City Basic Plan, agency and company-specific plans* |
| | ☐ Estimate emergency staffing levels and request personnel support, including specialized staff such as engineers, building inspectors, heavy equipment operators, and/or environmental remediation contractors. | |

| Flood Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Develop and initiate shift rotation plans, including briefing of replacements during shift changes. | *SOPs and command structure for City EOC, Incident Action Plan* |
| | ☐ Submit requests for disaster/emergency declaration, as applicable. | *City Basic Plan* |
| | ☐ Coordinate the evacuation of the affected area, if necessary. Assign appropriate agency liaisons to the City EOC, as the situation requires. | *FA 1 of the City EOP* |
| | ☐ Support Search and Rescue operations by coordinating resource requests outside of the jurisdiction. | *FA 1 of the City EOP* |
| | ☐ Request the American Red Cross to activate sheltering plans and open/staff shelters, if needed. | *American Red Cross Shelter Plans* |
| | ☐ Establish a JIC.<br>☐ Formulate emergency public information messages and media responses using "one message, many voices" concepts. | *FA 1 of the City EOP* |
| | ☐ Record all EOC activities, completion of personnel tasks, incoming and outgoing messages, and the names of those sending and receiving them. These should be documented in EOC logbooks. | *Existing ICS and EOC forms, ICS Form 214 – Unit Log* |
| | ☐ Begin damage assessments in coordination with the Public Works Department and County/local government. | *FA 3 of the City EOP* |
| | ☐ Assist with in coordinating Public Works activities, such as debris removal from:<br>▪ Storm drains<br>▪ Bridge viaducts<br>▪ Main arterial routes<br>▪ Public rights-of-way<br>▪ Dams (via established liaisons at the City EOC)<br>▪ Other structures, as needed | *FA 3 of the City EOP* |
| | ☐ Contact local contractors for support, if necessary. Establish contact with private sector partners and/or dam operators (if the flood is associated with dam failure or malfunction). | *Existing contact lists at EOC* |
| | ☐ Coordinate with City Police Departments, County Sheriff's Office, and other local police departments to provide law enforcement to affected areas (curfew enforcement, road closures, security, etc.). | *FA 1 of the City EOP* |

| Flood Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Collect and chronologically file records and bills generated during the incident in order to ensure timely submittal of documents for reimbursement. | |
| **RECOVERY PHASE** | ☐ Monitor secondary hazards associated with floods (landslides, contamination, damage to bridges/roads, impacts to utility lines/facilities) and maintain on-call personnel to support potential response to these types of hazards. | |
| | ☐ Deactivate/demobilize the City EOC. Deactivate mutual aid resources as soon as possible. | *FA 1 of the City EOP, ICS Form 221 – Demobilization Plan* |
| | ☐ Activate and implement applicable mitigation plans, community recovery procedures, and continuity of operations/government plans until normal daily operations can be completely restored. | *FA 1 of the City EOP and agency-specific recovery plans* |
| | ☐ Implement revisions to the City EOP and supporting documents based on lessons learned and best practices adopted during response. | |
| | ☐ Offer recommendations to City government and Public Works departments for changes in planning, zoning, and building code ordinances. | |
| | ☐ Participate in After Action Reports and critiques. Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov). | |

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# 5 IA 5 – Major Fire

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| Major Fire Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **PRE-INCIDENT PHASE** | ☐ Arrange for personnel to participate in necessary training and exercises, as determined by City Emergency Management and Fire District. | |
| | ☐ Participate in City preparedness activities, seeking understanding of interactions with participating agencies in a major fire scenario. | |
| | ☐ Ensure that emergency contact lists are current and establish a pre-event duty roster allowing for 24/7 operational support to the City EOC. | |
| | ☐ Inform City Emergency Management of any major developments that could adversely affect response operations (e.g, personnel shortages, loss of firefighting equipment, etc.). | |
| **RESPONSE PHASE** | ☐ Activate the City EOC and establish Incident or Unified Command, as appropriate. Staffing levels vary with the complexity and needs of the response. At a minimum, the IC, all Section Chiefs, the Resource Coordinator and management support positions will be included. | *Section 5 of the City EOP, agency and company-specific plans* |
| | ☐ Estimate emergency staffing levels and request personnel support. | |
| | ☐ Develop work assignments for ICS positions (*recurring).* | *ICS Form 203-Organization Assignment List* |
| | ☐ Notify supporting fire services agencies. | *FA 1 of the City EOP* |
| | ☐ Identify local, regional, and/or State agencies that may be able to mobilize resources and staff to the City EOC for support. | |
| | ☐ Determine the scope and extent of the fire (*recurring).* Verify reports and obtain estimates of the area that may be affected. | *ICS Form 209-Incident Status Summary* |
| | ☐ Notify command staff, support agencies, adjacent jurisdictions, coordinators, and/or liaisons of any situational changes. | |
| | ☐ Develop and initiate shift rotation plans, including briefing of replacements during shift changes. | |
| | ☐ Dedicate time during each shift to prepare for shift change briefings. | *Incident Action Plan* |
| | ☐ Confirm or establish communications links among City EOC, County EOC, and other Agency Operations Centers, as applicable. Confirm operable phone numbers and verify functionality of alternative communication equipment/channels. | *FA 1 of the City EOP* |

| Major Fire Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Ensure that all required notifications have been completed. Consider other local, County, regional, State, and Federal agencies that may be affected by the incident. Notify them of the status. | *FA 1 of the City EOP; Established emergency contact lists at the City EOC* |
| | ☐ Fire Chief assumes duties to direct resources for fires within the City. In the event of multiple fire agencies responding to the incident, the Fire Defense Board Chief, acting as the Fire Services Coordinator, will be integrated into the Operations Section of the County EOC. | *FA 1 of the City EOP* |
| | ☐ Manage and coordinate interagency functions. Providing multi-agency coordination is the primary goal. Assimilate into a UC structure if scope of response increases. | |
| | ☐ Implement local plans and procedures for fire operations. | *Agency-specific SOPs* |
| | ☐ Obtain current and forecasted weather to project potential spread of the fire (*recurring).* | |
| | ☐ Determine the need to conduct evacuations and sheltering activities (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Determine the need for additional resources and request as necessary through appropriate channels (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Submit request for a local or countywide disaster/emergency declaration, as applicable. | *Section 1.4.2 of City EOP* |
| | ☐ Activate mutual aid agreements. Activation includes placing backup teams on standby and alerting resource suppliers of both potential and current needs. | |
| | ☐ Coordinate resource access, deployment, and storage in the operational area. Resources to coordinate include equipment, personnel, facilities, supplies, procedures, and communications. Track resources as they are dispatched and/or used. | *ICS Resource Tracking Forms; FA 1 of the City EOP* |
| | ☐ Develop plans and procedures for registration of task fire forces/strike teams as they arrive on scene and receive deployment orders. | |
| | ☐ Establish a JIC. | *FA 1 of the City EOP* |
| | ☐ Formulate emergency public information messages and media responses utilizing “one message, many voices” concepts (*recurring).* | |

| Major Fire Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Public information focusing on fire prevention, control, and suppression will be reviewed by the Fire Chief (or designee). Information will be approved for release by the IC and Lead PIO prior to dissemination to the public. | *FA 1 of the City EOP* |
| | ☐ Record all EOC and individual personnel activities (*recurring*). All assignments, person(s) responsible, and actions taken should be documented in logbooks. | *EOC Planning Section job action guide, ICS Form 214 – Unit Log* |
| | ☐ Record all incoming and outgoing messages (*recurring*). All messages, and the names of those sending and receiving them, should be documented as part of the EOC log. | |
| | ☐ Produce situation reports (*recurring*). At regular intervals, the EOC Director and staff will assemble a Situation Report. | |
| | ☐ Develop an IAP (*recurring*). This document is developed by the Planning Section and approved by the IC. The IAP should be discussed at regular periodic intervals and modified as the situation changes. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Implement objectives and tasks outlined in the IAP (*recurring*). | |
| | ☐ Coordinate with the private sector partners as needed. | |
| **RECOVERY/ DEMOBILIZATION** | ☐ Ensure that all reports of injuries, deaths, and major equipment damage due to fire response are communicated to the IC and/or Safety Officer. | |
| | ☐ Ensure an orderly demobilization of emergency operations in accordance with current demobilization plans. | |
| | ☐ Release mutual aid resources as soon as possible. | |
| | ☐ Activate and implement applicable mitigation plans, community recovery procedures, and COOP/COG plans until normal daily operations can be completely restored. | *FA 1 of the City EOP; Agency recovery plans* |
| | ☐ Conduct post-event debriefing to identify success stories, opportunities for improvement, and development of the After Action Report/Improvement Plan. | |
| | ☐ Deactivate/demobilize the City EOC. | *FA 1 of the City EOP* |

| Major Fire Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Implement revisions to the City EOP and supporting documents based on lessons learned and best practices adopted during response. | |
| | ☐ Correct any response deficiencies reflected in the Improvement Plan. | |
| | ☐ Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov) | |

# 6 IA 6 – Transportation Accidents

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## IA 6. Transportation Accidents

Two major types of transportation accidents are considered in this incident annex: air and rail. Motor vehicle accidents that occur on roadways within the City would not normally constitute a major emergency under the Emergency Operations Plan unless hazardous materials or mass casualties/fatalities complicate the incident. Those contingencies are covered in other annexes.

The Fire District and Police Department will assume initial command if the transportation accident involves a fire and/or casualties and to secure the incident site. The Federal Aviation Administration (FAA) has the authority and responsibility to investigate all accidents involving aircraft. The National Transportation Safety Board (NTSB) has the authority and responsibility to investigate accidents involving all aircraft and selected rail accidents. It is NTSB policy to be on the scene of a major accident as soon as possible. In minor aircraft accidents, the FAA may respond to the scene instead of the NTSB. The Department of Defense has the authority to investigate any accident involving military aircraft.

| Transportation Accidents | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **PRE-INCIDENT PHASE** | ☐ Arrange for personnel to participate in necessary training and exercises, as determined by City Emergency Manager. | |
| | ☐ Participate in City preparedness activities, seeking understanding of interactions with participating agencies in a major transportation incident scenario. | |
| | ☐ Ensure that emergency contact lists are current and establish a pre-event duty roster allowing for 24/7 operational support to the City EOC. | |
| | ☐ Inform City Emergency Manager of any major developments that could adversely affect response operations (e.g., personnel shortages, loss of equipment, etc.). | |
| | ☐ Arrange for personnel to participate in necessary training and exercises, as determined by the City Emergency Manager and Fire District. | |
| | ☐ Assess the City's transportation infrastructure (e.g. roads, bridges, and traffic control devices) and implement an emergency transportation route plan. | |
| | ☐ Develop alternate routes based on assessment of hazard threats to transportation infrastructure and based on input from the County EOC, ODOT, and other road owners. | |
| **RESPONSE PHASE** | ☐ Notification of the occurrence of a transportation incident will come through the CCOM or observance by field personnel. | |
| | ☐ Conduct a scene assessment to determine the appropriate level of emergency medical, transportation, and HazMat response. Based on the location of the accident, mass casualty and/or evacuation procedures may be required. | *ICS Form 209: Incident Status Summary* |
| | ☐ Determine the type, scope, and extent of the HazMat incident (*recurring).* Verify reports and obtain estimates of the area that may be affected. | *IA 4. Hazardous Material Incident Annex* |

| Transportation Accidents | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Develop alternate routes based on assessment of damages to City transportation infrastructure and on input from the City EOC, ODOT, and other road owners. Estimate emergency staffing levels and request personnel support. | |
| | ☐ City personnel should not attempt to remove accident-related debris from the accident area except as necessary to facilitate fire suppression, rescue, and emergency medical care. | |
| | ☐ The Police Department has the authority to secure the crash site to maintain the integrity of the accident site (after fire suppression and victim rescue operations are complete). | |
| | ☐ Contact the NTSB prior to removing deceased victims or moving aircraft wreckage. Call: NTSB Safety Office 425-227-2000 (24 hours) | |
| | ☐ For railroad accidents, the IC should contact the railroad company's emergency response center, as well as the NTSB prior to removing any victims or wreckage. | |
| | ☐ Coordinate the collection, storage, and disposition of all human remains and their personal effects from the crash site. | |
| | ☐ Activate the City EOC and establish Incident or Unified Command, as appropriate. Staffing levels vary with the complexity and needs of the response. At a minimum, the IC, all Section Chiefs, the Resource Coordinator, and management support positions should be included. | |
| | ☐ If appropriate, the IC (or designee) will activate the EAS by contacting the National Weather Service (453-4561/2081) to initiate a public broadcast message. Radio and television stations will copy the message and interrupt regular programming for the emergency broadcast. | |
| | ☐ Develop work assignments for ICS positions (*recurring).* | *ICS Form 203: Organization Assignment List* |
| | ☐ Identify local, regional, and/or State agencies that may be able to mobilize resources and staff to the City EOC for support. | |
| | ☐ Notify supporting emergency response agencies, ODOT, NTSB, and FAA if the accident involves an aircraft. | |
| | ☐ Notify command staff, support agencies, adjacent jurisdictions, coordinators, and/or liaisons of any situational changes. | |

| Transportation Accidents | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Confirm or establish communications links among the City EOC, the County EOC, and other Agency Operations Centers, as applicable. Confirm operable phone numbers and verify functionality of alternative communication equipment/channels. | |
| | ☐ Ensure that all required notifications have been completed. Consider other local, County, regional, State, and Federal agencies that may be affected by the incident. Notify them of the status. | |
| | ▪ For incidents occurring on State highways, ensure that ODOT has been notified. | |
| | ▪ Contact appropriate key stakeholders and partners if the incident poses an actual or potential threat to State parks, recreational areas, historical sites, environmentally sensitive areas, tourist routes, or other designated areas. | |
| | ▪ If agricultural areas and livestock are potentially exposed or impacted, notify local extension services (Oregon State University), Oregon Department of Agriculture, and the State Veterinarian. | *ESF 11 Annex of the County EOP* |
| | ☐ Appoint a PIO to formulate emergency public information messages and media responses utilizing "one message, many voices" concepts (*recurring).* | |
| | ☐ Public information focusing on transit access points, control, and traffic control will be reviewed by the Chief of Police (or designee). Information will be approved for release by the IC and Lead PIO prior to dissemination to the public. | |
| | ☐ If necessary, establish a JIC staffed by PIOs from various agencies. | *FA 1 of the City EOP* |
| | ☐ Allow the airline or agency affected by the accident to confirm casualties and to notify the next of kin via prescribed methodology. | |
| | ☐ Advise the County EOC and ODOT of road restrictions and resource/support needs. | |
| | ☐ Coordinate provision of up-to-date information to friends and family of victims. Consideration should be given to keeping all such people in a central location, protected from the press, and where information can be provided as it becomes available. | |
| | ☐ Support the removal of debris in coordination with, or under the direction of, investigative agencies such as the TSA, NTSB, and FBI. | |
| | ☐ Submit a request for emergency/disaster declaration, as applicable. | *Chapter 1 of the City EOP* |

| Transportation Accidents | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ If necessary, determine the need to conduct evacuations and sheltering activities. | |
| | ☐ Coordinate with the American Red Cross to provide Shelter and Family Referral Services through the EOC. | |
| | ☐ Determine the need for additional resources and request them as necessary through appropriate channels. | |
| | ☐ Develop an IAP (*recurring*). This document is developed by the Planning Section and approved by the IC. The IAP should be discussed at regular intervals and modified as the situation changes. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Implement objectives and tasks outlined in the IAP (*recurring*). | |
| | ☐ Record all EOC and individual personnel activities (*recurring).* All assignments, person(s) responsible, and actions taken should be documented in logbooks. | *EOC Planning Section job action guide, ICS Form 214 – Unit Log* |
| | ☐ Record all incoming and outgoing messages (*recurring*). All messages, and the names of those sending and receiving them, should be documented as part of the EOC log. | |
| | ☐ Produce situation reports (*recurring*). At regular periodic intervals, the EOC Director and staff will assemble a Situation Report. | *ICS Form 209: Incident Status Summary* |
| **RECOVERY/ DEMOBILIZATION PHASE** | ☐ Ensure that all reports of injuries, deaths, and major equipment damage due to fire response are communicated to the IC and/or Safety Officer. | |
| | ☐ Coordinate with the American Red Cross to assist families affected by the transportation incident | |
| | ☐ Ensure an orderly demobilization of emergency operations in accordance with current demobilization plans. | *ICS Form 221 - Demobilization Plan* |
| | ☐ Release mutual aid resources as soon as possible. | |
| | ☐ If necessary, provide critical incident stress management to first responders. | |
| | ☐ Conduct post-event debriefing to identify success stories, opportunities for improvement, and development of the After Action Report/Improvement Plan. | |
| | ☐ Deactivate/demobilize the City EOC. | |
| | ☐ Implement revisions to the City EOP and supporting documents based on lessons learned and best practices adopted during response. | |
| | ☐ Correct any response deficiencies reflected in the Improvement Plan. | |

| Transportation Accidents | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov) | |

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# 7 IA 7 – Terrorism

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**Background Information**

This annex can be applied to incidents involving Weapons of Mass Destruction (WMD) and Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) materials.

Law enforcement agencies will normally take the lead role in crisis management. The City Police Department has the lead role in terrorism crisis management within the City and the County Sheriff's Office elsewhere in the County. The lead agencies for the State and Federal government are Oregon State Police and the Federal Bureau of Investigations (FBI).

The laws of the United States assign primary authority to State and local governments to respond to the consequences of terrorism; the Federal government aids as required. The City and County Emergency Operations Centers (EOCs) typically will be activated and have the lead role in terrorism consequence management for most types of terrorist incidents, but the County Health Department will be assigned the lead local role in terrorism consequence management for incidents involving biological agents. The Oregon Office of Emergency Management and Federal Emergency Management Agency are the State and Federal consequence management leads.

Definitions for crisis management and consequence management can be found in Appendix G of this EOP.

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **PRE-INCIDENT PHASE** | ☐ Continue to maintain and revise, as needed, the appropriate emergency response plans relating to terrorism response, including the City EOP and annexes. | |
| | ☐ Have personnel participate in necessary training and exercises, as determined by City Emergency Management. | |
| | ☐ Participate in City, County, regional, State, and Federal terrorism preparedness activities, seeking understanding of interactions with participating agencies in a terrorism scenario. | |
| | ☐ Ensure that emergency contact lists are updated and establish a pre-event duty roster allowing for 24/7 operational support for the City EOC. Include appropriate regional, State, and Federal emergency contacts for terrorism response. | *Existing emergency contact lists* |
| | ☐ Ensure that terrorism response equipment and personnel inventories for the City and for the regional teams are updated. This includes response to CBRNE agents. Test and maintain response and communications equipment. Keep a stock of necessary supplies. | |

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Inform City Emergency Management of any major developments that could adversely affect response operations (e.g., personnel shortages, loss of firefighting equipment, etc.). | |
| | ☐ Provide public safety information and educational programs for terrorism emergency preparedness and response. | |
| **SURVEILLANCE PHASE (BIO ONLY)** | ☐ Activate Incident/Unified Command upon recommendation from the City Police Department. Unified Command may consist of County, regional, State, and Federal crisis management and consequence management agencies. | |
| | ☐ Mobilize appropriate emergency personnel and first responders. When necessary, send fire, HazMat, law enforcement, public health, and other personnel to the site. Determine responder activities and establish non-contaminated areas prior to mobilizing resources. | |
| | ☐ Evaluate the safety of emergency personnel. Initiate development of site- and agent-specific health and safety plan. | |
| | ☐ Assess the situation/confirm the WMD/CBRNE incident. Gather all available data regarding the status of the incident. Record the information using established forms, log sheets, and templates. Use of standard ICS forms may be necessary. | *ICS Form 209: Incident Status Summary* |
| | ☐ Activate public notification procedures. Contact agency and partner emergency personnel to ensure that they are aware of the incident status and are available and staffed to respond. | |
| | ☐ Control the scene. Alert the public and consider shelter-in-place needs, relocation of people/animals, and special needs. This task should be coordinated with law enforcement. | |
| | ☐ Conduct hazard assessment. In the case of a possible intentional release, begin addressing information needs for criminal investigation. For example, what is the ultimate purpose of the biological release? What is the target? Do further hazards and secondary threats exist? What is the source of release? | |

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Draft an IAP. Outline response goals and timelines and prepare for longer term (1–7 day) logistics, staffing, and operations. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Maintain communication between field response crews, local/County EOCs, the Regional EOC, and the State ECC, as applicable. Communication should be ongoing throughout the duration of the response and include incident status reports, resource requests, and projected staffing and equipment needs. | |
| | ☐ Gather additional information. Include photographs and video recording. | |
| | ☐ Determine whether the threat level for the affected area should be elevated and inform appropriate agencies if so. | |
| | ☐ Determine if any advisories should be issued to the public. | |
| **RESPONSE PHASE** | ☐ If an explosive device is found, clear the immediate area and notify appropriate first responders. Be cognizant of any secondary devices that may be on site. | |
| | ▪ Be cognizant of any secondary devices that may be on site. | |
| | ▪ Be cognizant that CBRNE agents may be present. | |
| | ☐ Investigate the crime scene and collect vital evidence. | |
| | ☐ Activate the City EOP. | |
| | ☐ Activate the appropriate EOCs and establish Incident Command. For larger events that cross multiple jurisdictions, establish a Unified Command. During terrorism incidents, local and/or County EOCs may be staffed. Staffing levels vary with the complexity and needs of the response. At a minimum, the IC, all Section Chiefs, the Resource Coordinator, and management support positions will most likely be needed. | |
| | ☐ Estimate emergency staffing levels and request personnel support. | |

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Develop work assignments for ICS positions (*recurring).* | *ICS Form 203: Organization Assignment List* |
| | ▪ Establish an Incident Command Post near the incident location. The Incident Command Post should be located uphill and upwind of the incident location. | |
| | ☐ Notify supporting agencies (dependent on the type of incident) and the City Council. | *FA 1 of the City EOP* |
| | ▪ Identify local, County, regional, and/or State agencies that may be able to mobilize resources to the EOC for support. | |
| | ☐ Determine the type, scope, and extent of the Terrorism incident (*recurring).* Verify reports and obtain estimates of the area that may be affected. Also verify the status of critical infrastructure. | *ICS Form 209: Incident Status Summary* |
| | ▪ Notify the regional HazMat team, public health agencies, support agencies, dispatch centers/public safety answering points, adjacent jurisdictions, Federal agencies (including FBI), and ESF leads/coordinators of any situational changes. | |
| | ▪ Verify that the hazard perimeter and hazard zone security have been established. | |
| | ▪ Ensure that a health and safety plan is developed by the designated Safety Officer, including health monitoring of first responders in accordance with all applicable guidance. | |
| | ▪ Assess the type, severity, and size of the incident. If possible, characterize the hazardous material(s) of concern and determine appropriate personal protection equipment requirements. | |
| | ☐ Determine whether the threat level for the affected area should be elevated and inform appropriate agencies. | |
| | ☐ Disseminate appropriate warnings to the public. | *FA 1 of the City EOP* |
| | ☐ Develop and initiate shift rotation plans, including briefing of replacements during shift changes. | |
| | ▪ Dedicate time during each shift to preparing for shift change briefings. | *e* |

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Confirm or establish communications links among primary and support agencies, the City EOC, the County EOC, and State ECC. Confirm operable phone numbers and backup communication links. | *FA 1 of the City EOP* |
| | ☐ Ensure that all required notifications have been completed. Consider other local, regional, State, and Federal agencies that may be affected by the incident. Notify them of the status. | *Established emergency contact lists maintained at the EOC* |
| | ▪ Notification to the Oregon State Police and the FBI is required for all terrorism incidents. | |
| | ▪ If an incident occurs on State highways, ensure that ODOT has been notified. | |
| | ▪ Contact appropriate key stakeholders and partners if the incident poses an actual or potential threat to State parks, recreational areas, historical sites, environmentally sensitive areas, tourist routes, or other designated areas. | |
| | ▪ If agricultural areas and livestock are potentially exposed, contact local Extension Services (Oregon State University), County Health Department, ODA, and the State Veterinarian, as applicable to situation. | *ESF 11 Annex to the County EOP* |
| | ☐ Manage and coordinate interagency functions. Providing multi-agency coordination is the primary goal. Assimilate into a Unified Command structure as dictated by the incident. | |
| | ☐ Implement local plans and procedures for terrorism operations. Ensure that copies of all documents are available to response personnel. Implement agency-specific protocols and SOPs. | *County Terrorism Response Plan* |
| | ☐ Obtain current and forecasted weather to project potential HazMat vapor plumes (*recurring).*<br>▪ Note: Vapor plume modeling support may be obtained through regional HazMat teams and/or through State, and/or Federal environmental protection agencies. | *FA 1 of the City EOP* |

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Determine the need to implement evacuations and sheltering activities (*recurring).* A determination of the use of shelter-in-place for surrounding residences and public facilities should be made.<br>▪ Note: Refer to the U.S. Department of Transportation Emergency Response Guidebookfor determining the appropriate evacuation distance from the source. | *FA 1 of the City EOP* |
| | ☐ Determine the need for and activate emergency medical services (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Determine the need for additional resources and request as necessary through appropriate channels (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Submit a request for emergency/disaster declaration, as applicable. | *Section 1.4.2 of the City EOP* |
| | ☐ Activate mutual aid agreements. Activation includes placing backup teams on standby and alerting resource suppliers of both potential and current needs. | |
| | ☐ Coordinate resource access, deployment, and storage in the operational area. Resources to coordinate include equipment, personnel, facilities, supplies, procedures, and communications. Track resources as they are dispatched and/or used. | *ICS Resource Tracking Forms* |
| | ☐ Develop plans and procedures for registering regional HazMat or health and medical teams as they arrive on the scene and receive deployment orders. | |
| | ☐ Establish a JIC. | *FA 1 of the City EOP* |
| | ☐ Formulate emergency public information messages and media responses utilizing “one message, many voices” concepts (*recurring).* | |
| | ▪ Public information will be reviewed and approved for release by the IC and lead PIO before dissemination to the public and/or media partners. | *FA 1 of the City EOP* |
| | ☐ Record all EOC activity and completion of individual personnel tasks (*recurring).* All assignments, person(s) responsible, and significant actions taken should be documented in logbooks. | *EOC Planning Section job action guide, ICS Form 214 – Unit Log* |

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Record all incoming and outgoing messages (*recurring*). All messages, and the names of those sending and receiving them, should be documented as part of the EOC log. | |
| | ☐ Develop and deliver situation reports (*recurring*). At regular intervals, the EOC Director and staff will assemble a situation report. | |
| | ☐ Develop an IAP (*recurring*). This document is developed by the Planning Section and approved by the IC. The IAP should be discussed at regular intervals and modified as the situation changes. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Implement objectives and tasks outlined in the IAP (*recurring*). | |
| | ☐ Coordinate with private sector partners, as needed. | |
| | ☐ Ensure that all reports of injuries, deaths, and major equipment damage due to the terrorist incident are communicated to the IC and/or Safety Officer. | |
| **RECOVERY/ DEMOBILIZATION PHASE** | ☐ Ensure an orderly demobilization of emergency operations in accordance with current demobilization and community recovery plans. | *FA 1 of the City EOP* |
| | ☐ As applicable, clean-up activities will most likely be conducted by private contractors and coordinated among the City, the responsible party (if known), and the Oregon Department of Environmental Quality. Support from the Environmental Protection Agency may be necessary. | |
| | ☐ Activate, if necessary, the appropriate recovery strategies, continuity of operations plans, and/or continuity of government plans. | |
| | ☐ Release mutual aid resources as soon as possible. | |
| | ☐ Conduct a post-event debriefing to identify success stories, opportunities for improvement, and development of the After Action Report/Improvement Plan. | |
| | ☐ Deactivate/demobilize the EOC. | |
| | ☐ Correct any response deficiencies reflected in the Improvement Plan. | |
| | ☐ Revise any applicable emergency response plans based on the success stories and/or lessons learned during the response. | |

| Terrorism Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov) | |

# 8 IA 8 – Volcano/Volcanic Activity

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| Volcano/Volcanic Activity Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| **PRE-INCIDENT PHASE** | ☐ Arrange for personnel to participate in necessary training and develop exercises relative to volcanic events. | |
| | ☐ Provide information and training on volcano-hazard response to emergency workers and the public.<br>▪ Implement a public outreach program on volcano hazards.<br>▪ Review public education and awareness requirements. | *FA 1 of the City EOP* |
| | ☐ Participate in City and County preparedness activities, seeking understanding of interactions with participating agencies in a volcano scenario. | |
| | ☐ Ensure that contact lists are current and establish a pre-event duty roster allowing for 24/7 operational support to the City EOC. | |
| | ☐ Familiarize staff with requirements for requesting State and Federal Disaster Assistance. | *Stafford Act, FEMA guidance, and Oregon EMP* |
| | ☐ Inform City Emergency Management of any major developments that could adversely affect response operations (e.g., personnel shortages, loss of firefighting equipment, etc.). | |
| **RESPONSE PHASE** | ☐ Activate the City EOC and establish Incident or Unified Command, as appropriate. Contact appropriate private partners to assign liaisons to the EOC for coordination of specific response activities. Staffing levels vary with the complexity and needs of the response. At a minimum, the IC, all Section Chiefs, the Resource Coordinator, and management support positions should be included. | *FA 1 of the City EOP, agency and company-specific plans* |
| | ☐ Activate and implement the City EOP. | |
| | ☐ Notify supporting agencies.<br>▪ Identify local, regional, and State agencies that may be able to mobilize resources and staff to the City EOC for support | |
| | ☐ Provide local warnings and information and activate appropriate warning/alert systems. | *FA 1 of the City EOP* |
| | ☐ Support a Regional Coordination Center, if necessary. | |
| | ☐ Establish a JIC.<br>▪ Provide a PIO for the JIC.<br>▪ Formulate emergency public information | *FA 1 of the City EOP* |

| Volcano/Volcanic Activity Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | messages and media responses utilizing "one message, many voices" concepts (*recurring).* | |
| | ☐ Initiate and coordinate local emergency declarations or requests for assistance from mutual aid partners, County, State, and/or Federal resources. If applicable, submit request for local disaster/emergency declaration following established County procedures. | |
| | ☐ Estimate emergency staffing levels and request personnel support. | |
| | ☐ Develop work assignments for ICS positions (*recurring).* | *ICS Form 203-Organization Assignment List* |
| | ☐ Develop and initiate shift rotation plans, including briefing of replacements during shift changes. | *ICS Form 209-Incident Status Summary* |
| | ▪ Dedicate time during each shift to prepare for shift change briefings. | |
| | ☐ Confirm or establish communications links among primary and support agencies, the City EOC, County EOC, and State ECC; confirm operable phone numbers and backup communication links. | |
| | ☐ Ensure that all required notifications have been completed. Consider other local, regional, State, and Federal agencies that may be affected by the incident. Notify them of the status. | *Incident Action Plan* |
| | ☐ Manage and coordinate interagency functions. Providing multi-agency coordination is the primary goal. Assimilate into a Unified Command structure if scope of response increases. | *Established emergency contact lists maintained at the City EOC* |
| | ☐ Obtain current and forecasted weather to project potential spread of ash, fires, and/or gases (*recurring).* | |
| | ☐ Determine need to conduct evacuations and sheltering activities (*recurring).* Request that the American Red Cross activate and implement local sheltering plans. | *FA 2 Annex of the City EOP and American Red Cross Shelter Plans* |

| Volcano/Volcanic Activity Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Coordinate evacuation of affected areas, if necessary. Assign appropriate ESF liaisons to the City and/or County EOCs, as the situation requires. The following emergency functions may provide lead roles during various phases of evacuation:<br>▪ ESF 1 – Transportation<br>▪ ESF 2 – Emergency Telecommunications and Warning<br>▪ ESF 13 – Public Safety and Security<br>▪ ESF 15 – Emergency Public Information | *FA 1 of the City EOP* |
| | ☐ Determine the need for additional resources and request as necessary through the City EOC (*recurring).* | *FA 1 of the City EOP* |
| | ☐ Activate mutual aid agreements. Activation includes placing backup teams on standby and alerting resource suppliers of both potential and current needs. | |
| | ☐ Coordinate resource access, deployment, and storage in the operational area. Resources to coordinate include equipment, personnel, facilities, supplies, procedures, and communications. Track resources as they are dispatched and/or used. | *FA 1 of the City EOP* |
| | ☐ Develop plans and procedures for registration of task forces/strike teams as they arrive on scene and receive deployment orders. | |
| | ☐ Record all EOC activity and completion of individual personnel tasks (*recurring).* All assignments, person(s) responsible, and significant actions taken should be documented in logbooks. | *ICS Resource Tracking forms and EOC forms* |
| | ☐ Record all incoming and outgoing messages (*recurring*). All messages, and the names of those sending /receiving, them should be documented as part of the EOC log. | *Existing EOC forms/templates* |
| | ☐ Produce situation reports (*recurring*). At regular intervals, the EOC Director and staff will assemble a situation report. | *EOC Planning Section job action guide* |

| Volcano/Volcanic Activity Incident Checklist | | |
|---|---|---|
| **Phase of Activity** | **Action Items** | **Supplemental Information** |
| | ☐ Develop an IAP (*recurring*). This document is developed by the Planning Section and approved by the IC. The IAP should be discussed at regular periodic intervals and modified as the situation changes. | *ICS Form 202 – Incident Objectives, ICS Form 203 – Organization Assignment List, ICS Form 204 – Assignment List, ICS Form 205 – Incident Radio Communications Plan, ICS Form 206 – Medical Plan, Safety Message, Incident Map* |
| | ☐ Implement elements of the IAP (*recurring*). | |
| | ☐ Coordinate with private sector partners as needed. | *ICS Form 202 – Incident Objectives* |
| | ☐ Ensure that all reports of injuries, deaths, and major equipment damage due to volcano/earthquake response are communicated to the IC and/or Safety Officer. | |
| **RECOVERY/ DEMOBILIZATION PHASE** | ☐ Activate and implement applicable mitigation plans, community recovery procedures, and continuity of operations/government plans until normal daily operations can be completely restored. Deactivate/demobilize the City EOC. | *FA 1 of the City EOP and agency-specific recovery* |
| | ☐ Release mutual aid resources as soon as possible. | |
| | ☐ Monitor secondary hazards associated with volcano eruption and/or significant activity (e.g. landslides, fires, contamination, damage to infrastructure, impacts to utility lines/facilities, and air quality issues) and maintain on-call personnel to support potential response to these types of hazards. | |
| | ☐ Conduct post-event debriefing to identify success stories, opportunities for improvement, and development of the After Action Report/Improvement Plan. | |
| | ☐ Correct any response deficiencies reflected in the Improvement Plan. | |
| | ☐ Submit valuable success stories and/or lessons learned to the Lessons Learned Information Sharing website (www.llis.gov) | |

# A

# SA A – Emergency Operations Plan Summary

## SA A. Emergency Operations Plan Summary

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# Table of Contents

# 1 Introduction

An Emergency Operations Plan (EOP) establishes guidance for the City of Sandy (City)'s actions during response to, and short-term recovery from, major emergencies or disasters. This EOP summary is designed to provide a summary of key points the City of Sandy feels are important for training purposes. For additional information regarding how the City will organize and respond to emergencies and disasters in the community, see the EOP Basic Plan and supporting annexes.

## 1.1 City of Sandy Disaster Declaration Process

Chapter 2.80 of the Sandy Municipal Code establishes the process for declaring and terminating a state of emergency.

Oregon Emergency Management has set forth the following criteria necessary in declaring a local emergency:

- Describe the circumstances impacting an identified area.
- Identify the problems for which assistance is needed.
- Clearly state what has been done locally to respond to the impact and needs.

*See Appendix A for Sample Declaration of State of Emergency form.*

## 1.2 Lines of Succession

Table 1 provides the policy and operational lines of succession during an emergency for the City.

**Table 1-8 City Lines of Succession**

| Emergency Operations | Emergency Policy and Governance |
|---|---|
| City Manager/Deputy City Manager | Mayor |
| Police Chief | Council President |
| Public Works Director | City Councilors (order of succession) |

Each City department is responsible for pre-identifying staff patterns showing a line of succession in management's absence. Lines of succession for each department can be found in the City's Continuity of Operations (COOP) plan. All employees should be trained on the protocols and contingency plans required to maintain leadership within the department. The City Manager will provide guidance and direction to department heads to maintain continuity of government and operations during an emergency. Individual department heads within the City

are responsible for developing and implementing COOP/Continuity of Government (COG) plans to ensure continued delivery of vital services during an emergency.

## 1.3 Request, Allocation, and Distribution of Resources

Resource requests and emergency/disaster declarations must be submitted by the City Emergency Manager to County Emergency Management according to provisions outlined under Oregon Revised Statutes (ORS) Chapter 401.

The City Emergency Manager (or designee) is responsible for the direction and control of the City's resources during an emergency and for requesting any additional resources required for emergency operations. Once mutual aid options have been exhausted, assistance requests are to be made through County Emergency Management via the County Emergency Operations Center. County Emergency Management processes subsequent assistance requests to the State.

In the case of fires that threaten life and structures, the Conflagration Act (ORS 476.510) can be invoked by the Governor through the Office of State Fire Marshal. This act allows the State Fire Marshal to mobilize and fund fire resources throughout the State during emergency situations. The Clackamas Fire District Fire Chief assesses the status of the incident(s) and, after determining that all criteria have been met for invoking the Conflagration Act, notifies the State Fire Marshal via Oregon Emergency Response System (OERS). The State Fire Marshal reviews the information and notifies the Governor, who authorizes the act.

*See Appendix B for summary of Mutual Aid Agreements.*

## 1.4 Financial Management

During an emergency, the City is likely to find it necessary to redirect City funds to effectively respond to the incident. The authority to adjust department budgets and funding priorities rests with the City Council. If an incident in the City requires major redirection of City fiscal resources, the City Council will meet in emergency session to decide how to respond to the emergency funding needs, will declare a State of Emergency, and will request assistance through the County as necessary.

Expenditure reports are submitted to the Finance Department and managed through the Finance Director to identify budgetary shortfalls. The Finance Department will support procurement issues related to personnel, both volunteer and paid. In addition, copies of expense records and all supporting documentation should be submitted for filing Federal Emergency Management Agency (FEMA) Public Assistance reimbursement requests.

## 1.5 Safety of Employees and Family

All department heads (or designees) are responsible for the safety of employees. Employees should attempt to contact their supervisors and managers within the first 24 hours following an incident. Emergency 911 should only be utilized if emergency assistance is needed. Agencies and departments with developed COOP plans will establish alternate facilities and staff locations, as applicable. Notification procedures for employee duty assignments will follow the required procedures established by each agency and department.

During biological incidents or public health emergencies such as influenza pandemics, maintaining a resilient workforce is essential to performing the response activities required to protect the City and surrounding community from significant impacts to human lives and the economy. Thus, personnel should be provided with tools to protect themselves and their families while they provide health and medical services during a pandemic or other type of public health emergency.

Safety precautions and personal protective equipment decisions will be specific to the type of incident occurring and will require just-in-time training among the first responder community and other support staff to implement appropriate procedures.

If necessary, the Oregon Occupational Safety and Health Administration may provide assistance and guidance on worker safety and health issues. Information about emergency procedures and critical tasks involved in a biological emergency incident or disease outbreak is presented in Emergency Support Function (ESF) 8 of the County EOP.

While all City agencies and employees are expected to contribute to the emergency response and recovery efforts of the community, employees' first responsibility is to their own and their families' safety. Each employee is encouraged to develop family emergency plans to facilitate family safety and self-sufficiency, which in turn will enable employees to assume their responsibilities to the County and its citizens as rapidly as possible.

Processes that support employees and their families during emergency situations or disasters will be further developed through ongoing COOP and COG planning.

# 2 Roles and Responsibilities

For more information on Roles and Responsibilities, refer to Chapter 3 of the EOP Basic Plan.

## 2.1 Responsibilities of All Departments

It is the responsibility of all departments to identify critical functions and develop procedures for maintaining and/or reestablishing services provided to the public and other City departments.

## 2.2 Responsibilities by Function

### 2.2.1 Alert and Warning

*City Police Department, Clackamas Fire District, City Administration, Oregon TrailSchool District and Clackamas County Communications (CCOM)*

Once an emergency has occurred, the following tasks are necessary to ensure that the proper agencies are notified, helping to facilitate a quick and coordinated response:

- Disseminating emergency public information, as requested.
- Receiving, verifying, and disseminating warning information to the public and key County and City officials.
- Preparing and maintaining supporting Standard Operating Procedures (SOPs) and annexes.

*See Functional Annex (FA) 1 – Emergency Services and the County EOP, ESF 2 – Communications for more detail.*

### 2.2.2 Public Works and Engineering

*City Public Works Department, City Building Department*

City public works agencies are responsible for the following tasks in an emergency:

- Barricading hazardous areas.
- Performing priority restoration of streets and bridges.
- Protecting and restoring waste treatment and disposal systems.
- Augmenting sanitation services.
- Assessing damage to streets, bridges, traffic control devices, waste-water treatment system, and other public works facilities.
- Removing debris.
- Assessing damage to City-owned facilities.
- Condemning unsafe structures.
- Directing temporary repair of essential facilities.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 3 – Infrastructure Services and the County EOP, ESF 3 – Public Works and Engineering for more detail.*

### 2.2.3 Firefighting

*Clackamas Fire District and Clackamas Fire District 1*

City fire services are responsible for the following tasks during an emergency:

- Providing fire prevention, education, inspection, suppression, and emergency medical aid to prevent loss of life, loss of property, and damage to the environment.
- Inspecting damaged areas for fire and life safety hazards.
- Providing hazardous materials spills containment, clean-up, planning,, and coordination.
- Inspecting shelters for fire and life safety hazards and coordinating with the Mass Care Liaison.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 4 – Firefighting for more detail.*

### 2.2.4 Emergency Management

**Emergency Operations Center**

*City Administration and City Police Department, Clackamas Fire District, and OregonTrail School District*

The following tasks are necessary for the City to activate and utilize its EOC to support and coordinate response operations during an emergency:

- Directing and controlling local operations resources.
- Maintaining contact with neighboring jurisdictions and the County EOC.
- Maintaining the EOC in an operating mode at all times or ensuring the ability to convert EOC space into an operating condition.
- Assigning representatives (by title) to report to the EOC and developing procedures for crisis training.
- Developing and identifying duties of staff, use of displays and message forms, and procedures for EOC activation.

*See Chapter 5 – Command and Control, FA 1 – Emergency Services, and the County EOP Basic Plan and ESF 5 – Emergency Management for more detail.*

### 2.2.5 Mass Care, Emergency Assistance, Housing, and Human Services

*Clackamas County Health, Housing and Human Services, American Red Cross, and Oregon Trail SchoolDistrict*

The City relies on the support of the County to provide Shelter and Mass Care Services and has adopted the procedures outlined in the County EOP. County Health, Housing and Human Services (also referred to as H3S Department), with support from the Oregon Trail Chapter of the American Red Cross, is responsible for ensuring that the mass care needs of the affected population are met, such as sheltering, feeding, providing first aid, and reuniting families. Relevant operations are detailed in the County EOP, ESF 6 – Housing and Human Services and ESF 11 – Agriculture and Natural Resources; general responsibilities include:

- Maintaining the Community Shelter Plan and Animal Disaster Response Plan.
- Supervising the Shelter Management program (stocking, marking, and equipping, etc.) for natural disasters.
- Coordinating support with other City and County departments, relief agencies, and volunteer groups.
- Designating a coordinator/liaison to participate in all phases of the County emergency management program, when necessary or as requested.

*See FA 2 – Human Services and the County EOP, ESF 6 – Mass Care, Emergency Assistance, Housing, and Human Services and ESF 11 – Agriculture and Natural Resources for more detail.*

### 2.2.6 Search and Rescue

*Clackamas County Sheriff's Office*

The Sheriff's Office is responsible for:

- Coordinating available resources to search for and rescue persons lost outdoors.
- Cooperating with and extending assistance to surrounding jurisdictions, on request and as resources allow.
- Establishing and monitoring training standards for certification of search and rescue personnel.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 9 – Search and Rescue for more detail.*

### 2.2.7 Oil and Hazardous Materials Response

*Clackamas Fire District and Office of State Fire Marshal Regional HazMat TeamNo. 3*

**Hazardous Materials Response**
Oil and Hazardous Materials responsibilities include:

- Conducting oil and hazardous materials (chemical, biological, etc.) response.
- Assessing the health effects of a hazardous materials release.
- Identifying the needs for Hazardous Materials incident support from regional and State agencies.
- Disseminating protective action.
- Conducting environmental short- and long-term cleanup.
- Preparing and maintaining supporting SOPs and annexes.

**Radiological Protection**
General responsibilities include:

- Establishing and maintaining a radiological monitoring and reporting network.
- Securing initial and refresher training for instructors and monitors.
- Providing input to the Statewide monitoring and reporting system.
- Under fallout conditions, providing City and County officials and department heads with information regarding fallout rates, fallout projections, and allowable doses.
- Coordinating radiological monitoring throughout the County.
- Providing monitoring services and advice at the scene of accidents involving radioactive materials.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 10 – Oil and Hazardous Materials for more detail.*

### 2.2.8 External Affairs

*City Administration, Clackamas Fire District, and Oregon Trail School District*

The following tasks are necessary to ensure provision of reliable, timely, and effective information/warnings to the public at the onset of, and throughout, a disaster:

- Conducting ongoing hazard awareness and public education programs.
- Compiling and preparing emergency information for the public in case of emergency.
- Arranging for media representatives to receive regular briefings on the City's status during extended emergency situations.
- Securing printed and photographic documentation of the disaster situation.
- Handling scheduled and unscheduled inquiries from the media and the public.
- Being aware of Spanish-only-speaking and/or bilingual population centers within the City and County and preparing training and news releases accordingly.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services and the County EOP, ESF 15 – External Affairs for more detail.*

### 2.2.9 Evacuation and Population Protection

*City Police Department*

The following tasks are necessary to implement and support protective actions by the public and coordinate an evacuation:

- Defining responsibilities of City departments and private-sector groups.
- Identifying high hazard areas and corresponding number of potential evacuees.
- Coordinating evacuation planning, including:
  - Movement control
  - Health and medical requirements
  - Transportation needs
  - Emergency public information materials

- Shelter and reception location.

- Developing procedures for sheltering in place.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 1 – Emergency Services for more details.*

### 2.2.10 Damage Assessment

*City Building Department*

The Building Department is responsible for:

- Establishing a damage assessment team from among City departments with assessment capabilities and responsibilities.
- Training and providing damage plotting team members to the EOC.
- Assisting in reporting and compiling information regarding deaths, injuries, and dollar damage to tax-supported facilities and to private property.
- Assisting in determining the geographic extent of the damaged area.
- Compiling estimates of damage for use by City officials in requesting disaster assistance.
- Evaluating the effect of damage on the City's economic index, tax base, bond ratings, insurance ratings, etc. for use in long-range recovery planning.
- Preparing and maintaining supporting SOPs and annexes.

*See FA 4 – Recovery strategy for more details.*

### 2.2.11 Legal Services

*City Counsel (Beery, Elsner & Hammond, LLP)*

City Counsel is responsible for the following tasks in the event of an emergency:

- Advising City officials regarding the emergency powers of local government and necessary procedures for invocation of measures to:
  - Implement wage, price, and rent controls
  - Establish rationing of critical resources
  - Establish curfews
  - Restrict or deny access
  - Specify routes of egress

- Limit or restrict use of water or other utilities
- Remove debris from publicly or privately owned property.

- Reviewing and advising City officials regarding possible liabilities arising from disaster operations, including the exercising of any or all of the above powers.
- Preparing and recommending local legislation to implement the emergency powers required during an emergency.
- Advising City officials and department heads regarding record keeping requirements and other documentation necessary for the exercising of emergency powers.
- Thoroughly reviewing and maintaining familiarity with current ORS 401 provisions as they apply to County or City government in disaster events.
- Preparing and maintaining supporting SOPs and annexes.

## 2.3 Response Matrix

Table 3-1 provides a matrix, by ESF, of the local, State, and Federal primary organizations that the City may rely on in the event of an emergency.

**Table 2 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 1 Transportation** | ■ Aviation/airspace management and control<br>■ Transportation safety<br>■ Restoration and recovery of transportation infrastructure<br>■ Movement restrictions<br>■ Damage and impact assessment | City Public Works Department<br>Sandy Area Metro<br>Oregon Housing & Associated Services (OHAS)-Wheels | Department of Transportation and Development | Department of Transportation | Department of Transportation |
| **ESF 2 Communications** | ■ Coordination with telecommunications and information technology industries<br>■ Restoration and repair of telecommunications infrastructure<br>■ Protection, restoration, and sustainment of national cyber and information technology resources<br>■ Oversight of communications within the Federal incident management and response structure | City Police Department<br>City Administration | Emergency Management<br>CCOM<br>Sheriff's Office<br>CARES | Oregon Emergency Management<br>Public Utility Commission | Department of Homeland Security (National Protection and Programs/ Cyber security and Communications/ National Communications System),<br>Department of Homeland Security (Federal Emergency Management Agency) |
| **ESF 3 Public Works & Engineering** | ■ Infrastructure protection and emergency repair<br>■ Infrastructure restoration<br>■ Engineering services and construction management<br>■ Emergency contracting support for life-saving and life-sustaining services | City Public Works Department<br>Curran McLeod, Inc. | Department of Transportation and Development | Department of Transportation | Department of Defense (U.S. Army Corps of Engineers)<br>Department of Homeland Security (FEMA) |
| **ESF 4 Firefighting** | ■ Coordination of Federal firefighting activities<br>■ Support to wildland, rural, and urban firefighting operations | Clackamas Fire District | Emergency Management<br>Fire Defense Board | Department of Forestry<br>Office of the State Fire Marshal | Department of Agriculture (U.S. Forest Service) |

**Table 2 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 5 Emergency Management** | ■ Coordination of incident management and response efforts<br>■ Issuance of mission assignments<br>■ Resource and human capital<br>■ Incident action planning<br>■ Financial management | City Administration<br>City Police Department<br>Clackamas Fire District | Emergency Management | Oregon Emergency Management | Department of Homeland Security (FEMA) |
| **ESF 6 Mass Care, Emergency Assistance, Housing & Human Services** | ■ Mass care<br>■ Emergency assistance<br>■ Disaster housing<br>■ Human services | City Administration<br>American Red Cross | Health, Housing and Human Services | Department of Human Services<br>Oregon Health Authority | Department of Homeland Security (FEMA) |
| **ESF 7 Logistics Management & Resource Support** | ■ Comprehensive, national incident logistics planning, management, and sustainment capability<br>■ Resource support (facility space, office equipment and supplies, contracting services, etc.) | City Administration<br>Clackamas Fire District | Emergency Management | Oregon Military Department<br>Department of Administrative Services | General Services Administration<br>Department of Homeland Security (FEMA) |
| **ESF 8 Public Health & Medical Services** | ■ Public health<br>■ Medical services<br>■ Behavioral health services<br>■ Mass fatality management | City Administration (coordinate with Health Dept.)<br>Clackamas Fire District<br>American Medical Response<br>Local Clinics | Health, Housing and Human Services<br>Local Hospitals Local Emergency Medical Services | Department of Human Services (Public Health Division) | Department of Health and Human Services |

**Table 2 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 9 Search & Rescue** | ■ Life-saving assistance<br>■ Search and rescue operations | City Police Department | Sheriff's Office<br>Fire Defense Board | Oregon Emergency Management<br>Office of the State Fire Marshal | Department of Homeland Security (FEMA, U.S. Coast Guard)<br>Department of the Interior (National Park Service)<br>Department of Defense |
| **ESF 10 Oil & Hazardous Materials** | ■ Oil and hazardous materials (chemical, biological, radiological, etc.) response<br>■ Environment short- and long-term cleanup | Clackamas Fire District<br>Regional Hazardous Materials Team | Emergency Management<br>Fire Department | Department of Environmental Quality<br>Office of the State Fire Marshal | Environmental Protection Agency<br>Department of Homeland Security (U.S. Coast Guard) |
| **ESF 11 Agriculture & Natural Resources** | ■ Nutrition assistance<br>■ Animal and plant disease and pest response<br>■ Food safety and security<br>■ Natural and cultural resources and historic properties protection<br>■ Safety and well-being of household pets | City Administration | Emergency Management<br>Health, Housing and Human Services<br>Dog Services (DTD)<br>Oregon State University Extension | Department of Agriculture | Department of Agriculture<br>Department of Interior |
| **ESF 12 Energy** | ■ Energy infrastructure assessment, repair, and restoration<br>■ Energy industry utilities coordination<br>■ Energy forecast | City Administration<br>Local Utilities | Emergency Management | Department of Energy<br>Public Utility Commission | Department of Energy |

**Table 2 Response Partners by Emergency Support Function**

| Emergency Support Function | Scope (Federal) | Primary Local Agencies | Primary County Agency | Primary State of Oregon Agency | Primary Federal Agency |
|---|---|---|---|---|---|
| **ESF 13 Public Safety & Security** | ■ Facility and resource security<br>■ Security planning and technical resource assistance<br>■ Public safety and security support<br>■ Support to access, traffic, and crowd control | City Police Department | Sheriff's Office | Department of Justice<br>Oregon State Police<br>Department of Administrative Services | Department of Justice |
| **ESF 14 Long-Term Community Recovery** | ■ Social and economic community impact assessment<br>■ Long-term community recovery assistance to States, tribes, local governments, and the private sector<br>■ Analysis and review of mitigation program implementation | City Administration | Emergency Management<br>Health, Housing and Human Services | Oregon Business Development Department<br>Oregon Emergency Management<br>Governor's Recovery Planning Cell (Governors Recovery Cabinet) | Department of Agriculture<br>Department of Homeland Security<br>Department of Housing and Urban Development<br>Small Business Administration |
| **ESF 15 External Affairs** | ■ Emergency public information and protective action guidance<br>■ Media and community relations<br>■ Congressional and international affairs<br>■ Tribal and insular affairs | City Administration<br>Oregon Trail School District<br>Clackamas Fire District | Public and Government Affairs | Governor's Office<br>Oregon Emergency Management | Department of Homeland Security (FEMA) |

# 3 Concept of Operations

For more information on Concept of Operations, refer to Chapter 4 of the EOP Basic Plan.

## 3.1 Incident Levels

Incident levels assist response agencies in recognizing the degree of intensity and potential impact of a particular situation. Emergency situations will not always fit neatly into these levels, and any incident has the potential to intensify and expand. Special circumstances or external pressures may warrant outside assistance for relatively minor incidents.

### 3.1.1 Level 1

Level 1 situations are often referred to as "routine" crisis management or emergency situations that can be handled using resources available at the incident location. For these situations, it may not be necessary to implement an emergency plan. Outside assistance is usually not required.

### 3.1.2 Level 2

Level 2 situations are characterized by a need for response assistance from outside agencies (specialized equipment or personnel, insufficient or inadequate on-site resources, etc.). Requests for assistance related to Level 2 situations often take the form of a 911 call for police, fire, or medical assistance. Examples include hazardous materials spills and traffic incidents with multiple injuries. The Incident Commander may implement selected portions of the City EOP.

### 3.1.3 Level 3

Level 3 situations are major incidents that require application of a broad range of community resources to save lives and protect property. Examples of such situations include an airliner crash in populated area, a major earthquake, etc. Emergency plans should be implemented, and the EOC will be activated to coordinate response and recovery activities.

## 3.2 Incident Management

### 3.2.1 Activation

When an emergency arises and it is determined that the normal organization and functions of City government are insufficient to effectively meetresponse requirements, the City Council or City Manager will activate and implement all or part of this EOP. In addition, the City Manager, Fire Chief, Police Chief, or Emergency Manager, or their designees, may partially or fully activate and staff the City EOC based on an emergency's type, size, severity, and anticipated duration. An Emergency Declaration is not required to implement theEOP or activate the EOC. The Emergency Manager may implement the EOP as deemed appropriate for the situation or at the request of an Incident Commander.

Concurrently, all involved City emergency services will implement their respective plans, procedures, and processes and will provide the Emergency Manager with the following information:

- Operational status.
- Readiness and availability of essential resources.
- Changing conditions and status of resources (personnel, equipment, facilities, supplies, etc.).
- Significant concerns and issues dealing with potential or actual loss of life or property.

### 3.2.2 Initial Actions

Upon activation of all or part of this EOP, the Incident Commander (or designee) will immediately take the following actions:

- Alert threatened populations and initiate evacuation as necessary. *See FA 1 – Emergency Services Annex for more detail.*
- Initiate emergency sheltering procedures with the American Red Cross and other community partners if evacuation procedures are activated. *See FA 2 – Human Services Annex for more detail.*
- Instruct appropriate City emergency service providers to activate necessary resources.
- Assign radio frequencies and communications equipment, implement a communications plan, and confirm interoperability among EOC staff and response agencies.
- Request a formal Declaration of Emergency pursuant to SMC 2.80 when it is determined that local resources will not meet the needs of local emergency operations. The official declaration may be preceded by a verbal statement.
- Prepare to staff the City EOC as appropriate for the incident with maximum 12-hour shifts.
- City personnel and support staff will be deployed to restore normal activity and provide essential community services as soon as possible following the emergency. *See FA 4 – Recovery Strategy Annex for additional information regarding community recovery procedures.*

# 4 Command and Control

For more information on Command and Control, refer to Chapter 5 of the EOP Basic Plan.

## 4.1 Emergency Operations Center Activation

During emergency operations and upon activation, the EOC staff will assemble and exercise Direction and Control, as outlined below.

- The EOC will be activated by the City Manager, Police Chief, or Fire Chief (or their designees). The Incident Commander will assume responsibility for all operations and direction and control of response functions.
- The Incident Commander will determine the level of staffing required and will alert the appropriate personnel, agencies, and organizations.
- Emergency operations will be conducted by City departments, augmented as required by trained reserves, volunteer groups, and forces supplied through mutual aid agreements. County, State, and Federal support will be requested if the situation dictates.
- Communications equipment in the EOC will be used to receive information, disseminate instructions, and coordinate emergency operations.
- The Incident Commander may establish an on-scene command post at the scene to maintain close contact and coordination with the EOC.
- Department heads and organization leaders are responsible for emergency functions assigned to their activities, as outlined in their respective annexes.
- The EOC will normally operate on a 24-hour basis, rotating on 12-hour shifts, or as needed.
- The Incident Commander will immediately notify the County Emergency Management office upon activation. Periodic updates will be issued as the situation requires.

## 4.2 Emergency Operations Center Location

The **primary location** for the City EOC is:

Sandy Police Department
39850 Pleasant Street, Sandy, OR 97055

If necessary, the **alternate location** for the City EOC is:

Fire Annex Building
17460 Bruns Avenue, Sandy, OR 97055

**Figure 5-1 Primary EOC Location**

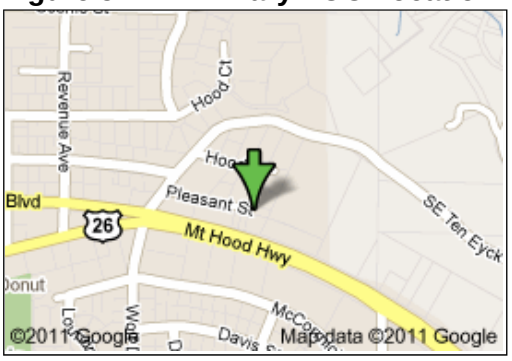
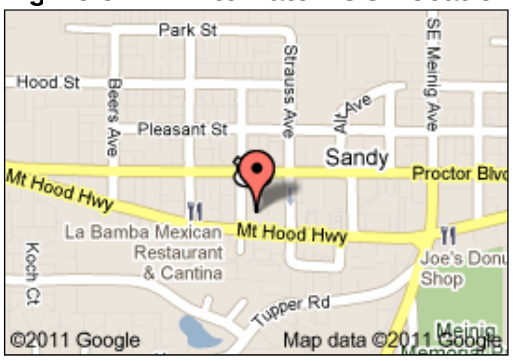


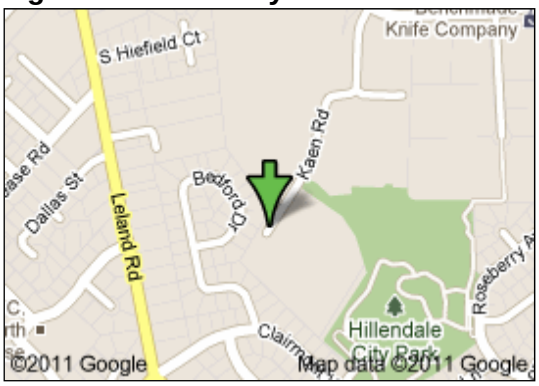

**Fig re 5-2 Alternate EOC Location**




The **County EOC** is co-located with Clackamas County Emergency Management and CCOM offices at:

2200 Kaen Road
Oregon City, OR 97045

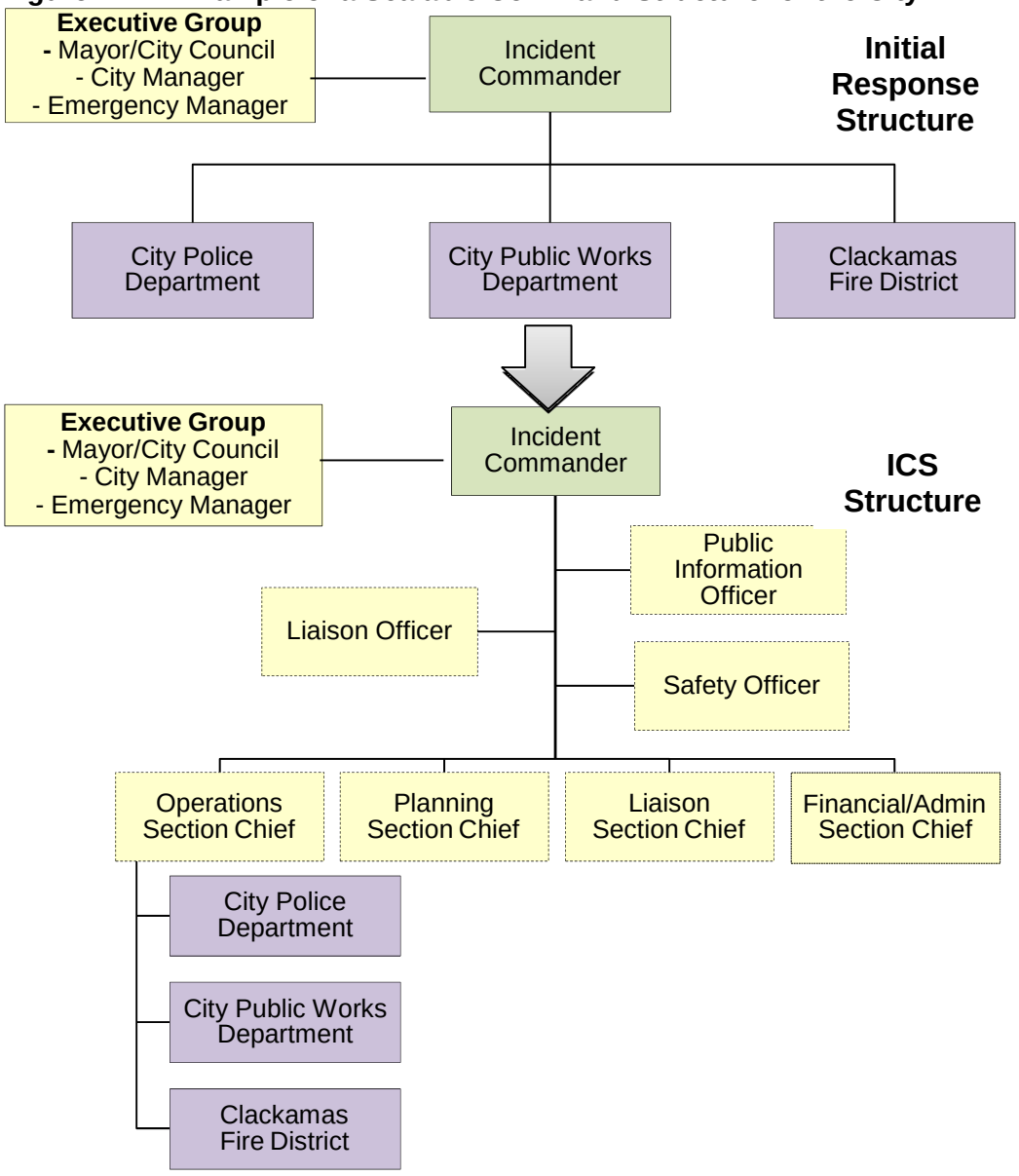
**Figure 5-3 County EOC Location**




*See FA 1 – Emergency Services for more detail.*

## 4.3 Incident Command System

**Figure 4 Example of a Scalable Command Structure for the City**




### 4.3.1 Emergency Operations Center Command Staff

#### 4.3.1.1 Incident Commander

The IC is responsible for the operations of the EOC when it is activated and has overall responsibility for accomplishing the EOC mission. In general, the IC is responsible for:

- Approving and supporting implementation of an Incident Action Plan (IAP).
- Coordinating activities supporting the incident or event.

- Approving release of information through the Public Information Officer (PIO).
- Performing the duties of the following command staff if no one is assigned to the position:
  - Safety Officer
  - PIO
  - Liaison Officer
  - General Staff.

#### 4.3.1.2 Safety Officer

The Safety Officer is generally responsible for:

- Identifying initial hazards, determining personal protective equipment requirements, and defining decontamination areas.
- Implementing site control measures.
- Monitoring and assessing the health and safety of response personnel and support staff (including EOC staff).
- Preparing and implementing a site Health and Safety Plan and updating the Incident Commander regarding safety issues or concerns, as necessary.
- Exercising emergency authority to prevent or stop unsafe acts.

#### 4.3.1.3 Public Information Officer

A lead PIO will most likely coordinate and manage a larger public information network representing local, County, regional, and State agencies; tribal entities; political officials; and other emergency management stakeholders. The PIO's duties include:

- Developing and coordinating release of information to incident personnel, media, and the public.
- Coordinating information sharing among the public information network through the use of a Joint Information System and, if applicable, establishing and staffing a Joint Information Center.
- Implementing information clearance processes with the Incident Commander.
- Conducting and/or managing media briefings and implementing media-monitoring activities.

#### 4.3.1.4 Liaison Officer

Specific liaison roles may be incorporated into the command structure established at the City and/or County EOC, depending on the type of emergency incident that has occurred. Liaisons represent entities and organizations such as hospitals, school districts, tribes, public works/utility companies, and volunteer services such as the American Red Cross. Responsibilities typically associated with a liaison role include:

- Serving as the contact point for local government officials, agency or tribal representatives, and stakeholders.
- Coordinating information and incident updates among interagency contacts, including the public information network.
- Providing resource status updates and limitations among personnel, capabilities, equipment, and facilities to the Incident Commander, government officials, and stakeholders.

The annexes attached to this plan contain general guidelines for the City governmental entities, organizations, and County officials and departments to carry out responsibilities assigned at the City EOC or other designated facility where response efforts will be coordinated.

### 4.3.2 Emergency Operations Center General Staff

#### 4.3.2.1 Operations Section Chief

The Operations Section Chief position is typically filled by the lead agency managing response activities for a specific type of incident. The Operations section is organized into functional units representing agencies involved in tactical operations. The following agencies are typically included in the Operations Section:

- Fire (emergencies dealing with fire, earthquake with rescue, or hazardous materials).
- Law Enforcement (incident(s) involving civil disorder/disturbance, significant security/public safety concerns, transportation-related accidents, and/or criminal investigations).
- Public Health Officials (contamination issues, disease outbreaks, and/or emergency incidents posing threats to human, animal, and environmental health).
- Public Works (incidents resulting in major utility disruptions, damage to critical infrastructure, and building collapse).

Private entities, companies, and Non-Governmental Organizations (NGOs) may also support the Operations section. The Operations Chief is responsible for:

- Providing organizational support and directing implementation of unit operational plans and field response activities.
- Developing and coordinating tactical operations to carry out the IAP.
- Managing and coordinating various liaisons representing community response partners and stakeholders.
- Directing IAP tactical implementation.
- Requesting resources needed to support the IAP.

#### 4.3.2.2 Planning Section Chief

The Planning Section is responsible for forecasting future needs and events of the response effort while ensuring implementation of appropriate procedures and processes. This section is typically supported by four primary units: Resources, Situation, Documentation, and Demobilization. The Planning Chief is responsible for:

- Collecting, evaluating, and distributing information regarding the incident and providing a status summary.
- Preparing and disseminating the IAP.
- Conducting planning meetings and developing alternatives for tactical operations.
- Maintaining resource status.

#### 4.3.2.3 Logistics Section Chief

The Logistics Section is typically supported by the units responsible for Supply, Food, Communications, Medical, Facilities, and Ground Support. Depending on the incident's type and size, these units can be divided into two branches: Service and Support. The Logistics Chief is responsible for:

- Providing and managing resources to meet the needs of incident personnel.
- Managing various coordinators of particular resources, such as transportation-related equipment, EOC staff support services, supplies, facilities, and personnel.
- Estimating future support and resource requirements.
- Assisting with development and preparation of the IAP.

#### 4.3.2.4 Finance/Administration Section Chief

The Finance/Administration Section is specific to the incident type and severity of resulting impacts. In some instances, agencies may not require assistance, or only a specific function of the section may be needed that can be staffed by a technical specialist in the Planning section. Potential units assigned to this section include Compensation/Claims, Procurement, Cost, and Time. The Finance and Administration Chief is responsible for:

- Monitoring costs related to the incident.
- Maintaining accounting, procurement, and personnel time records.
- Conducting cost analyses.

# 5 Appendices

- Appendix A – Sample Declaration of State of Emergency
- Appendix B – Summary of Mutual Aid Agreements

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# Appendix A – Sample Declaration of State of Emergency

To: _____,
Clackamas County Office of Emergency Management

From:_____,
City of Sandy, Oregon

At_____(time) on_____(date),

a/an _____ (description

of emergency incident or event type) occurred in the City of Sandy threatening life and property.

The current situation and conditions are:

_____

_____

_____

The geographic boundaries of the emergency are:

_____

_____

WE DO HEREBY DECLARE THAT A STATE OF EMERGENCY NOW EXISTS IN THE CITY OF SANDY AND THAT THE CITY HAS EXPENDED OR WILL SHORTLY EXPEND ITS NECESSARY AND AVAILABLE RESOURCES. WE RESPECTFULLY REQUEST THAT THE COUNTY PROVIDE ASSISTANCE, CONSIDER THE CITY AN "EMERGENCY AREA" AS PROVIDED FOR IN ORS 401, AND, AS APPROPRIATE, REQUEST SUPPORT FROM STATE AGENCIES AND/OR THE FEDERAL GOVERNMENT.

Signed: _____

Title:_____ Date & Time: _____

*This request may be passed to the County via radio, telephone, or FAX. The original signed document must be sent to the County Emergency Management Office, with a copy placed in the final incident package.*

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## Appendix B – Mutual Aid Agreements

The following is a quick reference list of mutual aid agreements entered into by the City. **Copies of these mutual aid agreements can be found in Bold Planning.**

- **Bomb Arson Tracking System Program**; Sandy Police Department and the Bureau of Alcohol, Tobacco, Firearms and Explosives, Unknown date. Allows for the use of an information system that will collect, analyze information related to explosives, arson, and the suspected criminal misuse of explosives.

- **Clackamas County Dispatch Center Member Board Charter**; Sandy Police Department and the Clackamas County Dispatch Center Board Member Charter, July 3, 2009. Establishes an executive Boar and Service Committees for the 911 dispatch center that dispatches the Sandy Police Department. This agreement provides an avenue for operational and budgetary development of services.

- **Clackamas County Interagency Amber Alert Agreement**; Sandy Police Department and the Clackamas County Interagency Amber Alert Team, December 16, 2002. Mutual agreement by all law enforcement agencies in Clackamas County providing for the development of internal policy, process, and training as related to missing children. It is also agreed that the Sandy Police Department will follow the Amber Alert criteria and process of the Amber Alert Program.

- **Interagency Investigative Agreement**; Sandy Police Department and the Interagency Major Crimes Team for Clackamas County, November 2, 2006. This agreement provides guidelines ad policies for the inter-agency investigation of major crimes committed in the venues of the participating agencies. When activated a team of investigators will respond to a criminal incident in Sandy. The team will the assist in the investigation. Our detective is a team member and may be called upon to assist other agencies with their criminal investigations.

- **Intergovernmental Agreement** between City of Sandy and Clackamas Fire District, June 11, 1996. The Clackamas Fire District will provide fireprotection services to both City and adjoining area.

- **Intergovernmental Agreement** between Sandy Police Department and CCOM forming the 800 Radio Group.

- **Intergovernmental Agreement** between Sandy Police Department and CCOM forming the 800 Radio Group. This agreement is pursuant to ORS 190.010 and 190.030.

- **Oregon Public Works Emergency Response Cooperative Assistance Agreement**; Oregon Department of Transportation and City of Sandy, February 28, 2010. Enables public works agencies to support each other during an emergency, provides the mechanism for immediate response to the requesting agency when the responding agency determines it can provide the needed resources and expertise, and sets up the documentation needed to seek maximum reimbursement possible from appropriate federal agencies.

- **Sandy Police Department MOU with Todos Juntos,** October 24, 2010. Todos Juntos provides staff to oversee the Juvenile Diversion Program. Staff from Todos Juntos, have contact with juvenile offenders, do assessments, refer and assist family and youth in accessing community resources, and track all necessary documentation.

# POLICE CHIEF'S OATH OF OFFICE

STATE OF OREGON
COUNTY OF CLACKAMAS
CITY OF SANDY

I, **Patrick Huskey**, do solemnly swear that I will support the Constitution of the United States, and the Constitution of the State of Oregon, and the Laws therefore; and I will faithfully, honestly, and impartially discharge the duties of Police Chief during my continuance therein, to the best of my ability, so help me God.

_____
(CHIEF)

Subscribed and sworn to and before me this 5th day of August, 2024.

_____
Mayor Stan Pulliam
Sandy, Oregon

# STAFF REPORT

| | |
|---|---|
| **Meeting Type:** | City Council |
| **Meeting Date:** | August 5, 2024 |
| **From:** | Tyler Deems, City Manager |
| **Subject:** | Intergovernmental Agreement with Sandy Urban Renewal Agency |

**DECISION TO BE MADE:**

Whether to adopt an IGA outlining the roles and responsibilities of the City of Sandy (City) and Sandy Urban Renewal Agency (Agency).

**BACKGROUND / CONTEXT:**

The Sandy Urban Renewal Agency (Agency) was established in 1998. The Agency has adopted an Urban Renewal Plan, most recently amended in 2018. The City of Sandy (City) and Agency frequently work together to accomplish the objectives of the Sandy Urban Renewal Plan. Most often, the City contributes its experience in the provision of administrative services (general administration, finance, legal, and technology). An IGA should have been adopted at the time the Agency was created to ensure that the City could act on behalf of the Agency, and use City resources to carry out the Plan. Staff can find no documentation of such an IGA ever having been created. The intent of this IGA is to formalize the relationship between the Agency and the City, and to align with the provisions of ORS 190.010.

**BUDGET IMPACT:**

N/A

**RECOMMENDATION:**

Staff recommends adopting the IGA to align with the provisions of ORS 190.010.

**SUGGESTED MOTION LANGUAGE:**

“I move to approve the IGA between City of Sandy and Sandy Urban Renewal Agency, as provided in the meeting packet.”

**LIST OF ATTACHMENTS / EXHIBITS:**

- Intergovernmental Agreement between City of Sandy and Sandy Urban Renewal Agency

# INTERGOVERNMENTAL AGREEMENT BETWEEN THE CITY OF SANDY AND THE SANDY URBAN RENEWAL AGENCY

This Intergovernmental Agreement (Agreement) is entered into between The City of Sandy ("City"), an Oregon municipal corporation established under ORS Chapter 221, and the Sandy Urban Renewal Agency ("Agency"), a municipal corporation established under ORS Chapter 457.

WHEREAS, the Agency is charged with administering and implementing The Sandy Urban Renewal Plan ("Plan"), as adopted by the agency board on December 21, 1998 and last amended May 2018, and engages in redevelopment activities to carry out the Plan; and

WHEREAS, the City has experience in the provisions of administrative services for local governments and in planning and constructing public improvements and desires to assist the Agency in the planning and carrying out of the Plan, pursuant to ORS 457.320; and

WHEREAS, the City has the desire and the money to loan the Agency for implementation of the Plan as long as said funds are reimbursed to the City; and

WHEREAS, pursuant to ORS 190.010, the City and Agency are authorized to enter into intergovernmental agreements for the performance of functions and activities either one is authorized by law to perform.

**NOW, THEREFORE, THE CITY OF SANDY AND THE SANDY URBAN RENEWAL AGENCY AGREE AS FOLLOWS:**

**Section 1: <u>City Duties and Responsibilities</u>**

As requested and authorized by the Agency, the City shall provide administrative and development services to the Agency and undertake urban renewal activities as set forth in the adopted Plan, including but not limited to the following as set forth below.

a. **Administrative Services:** The City may provide the following administrative services to the Agency: records management and record-keeping, human resources, engineering, planning services, legal services, purchasing information, technology services including internet and telephone service, office space and supplies, staff support for meetings (including preparation of meeting notices, agendas and minutes) and budget preparation and oversight. In doing so, the City shall provide such services in compliance with the laws of the State of Oregon, and in accordance with the Plan and this Agreement.

b. **Financial Assistance:** Pursuant to ORS 457.320, the City may loan money and provide other forms of financial assistance to the Agency in order to assist in carrying out the Plan. Any such assistance is to be properly documented and contain adequate provisions for the repayment of any loan made by the City to the Agency. Interest on any loan will be

calculated based on the rate the City would receive if those funds were invested in the Local Government Investment Pool (base rate) +1%. The rate shall be annual and will be set July 1 of each Fiscal Year. Compounding of interest will correspond with the repayment schedule. The base rate will be calculated as an average of the prior 12 months, or the rate for the preceding June, whichever is higher.

c. **Public Improvement and other Public Contracting Assistance:** The City agrees to act, when appropriate upon request of the Agency, as the agent of the Agency for purposes of forming local improvement districts, soliciting procurements, awarding bids, assessments, and all other usual and necessary activities normally performed by the City with reference to public improvement projects in, and other public contracts for, the City.

d. Nothing herein shall be construed to prohibit the Agency from contracting with third parties to provide any of the services listed above:

**Section 2: <u>Agency Duties and Responsibilities</u>**

a. **Financial Management and Review:** The Agency is responsible for the oversight and management of the Plan and its projects, including, but not limited to: oversight of the fiscal health of the Agency and its authorized plan projects, management decisions affecting the fiscal status of the Agency, threshold and capacity of the Agency, and monitoring of all Agency revenues and expenditures. This includes annual budgeting and budget review of plan projects and funds, as required by Oregon local budget law (ORS 294.305 through 394.565). The Agency shall coordinate with the City as necessary to ensure proper oversight and management of Agency activities.

b. **Annual Reporting:** Pursuant to ORS 457.460, the Agency shall prepare and provide the Agency Board an annual financial report on the Agency and its projects no later than January 31 of each year.

c. **Financial Assistance:** The Agency is authorized to loan money and provide other forms of financial assistance to the City as the Agency Board, in its sole discretion, determines appropriate to carry out one or more projects described in the Plan. The Agency shall repay the City all contract expenses related to the Plan and report. Repayment shall be on a schedule mutually agreed to by the Agency and City.

**Section 3: <u>Shared Duties and Responsibilities</u>**

a. **Issuance of Debt for Urban Renewal Activity:** The Agency is ultimately responsible for negotiating and securing debt for the purpose of carrying out the Plan. City staff may assist the Agency with negotiating and securing debt by providing financial administrative assistance. Through a separate Memorandum of Understanding (MOU), the City may agree

to issue debt for the Agency with the Agency assuming financial responsibility for any associated debt service.

b. **Agency Staffing:** The City shall provide and supervise staff that performs Agency functions. City employees engaged in Agency activities are employees of the City and subject to the City's employment policies, procedures, and standards. It is also the intent of the parties that the services performed by City employees on behalf of the Agency shall not interfere with the ability of such employees to carry out their duties for the City.

c. **Reimbursement for Services:** The City may seek reimbursement from the Agency for reasonable costs of services provided on behalf of the Agency. The City shall provide sufficient documentation and detail of service provided to the Agency.

**Section 4: Additional Terms**

a. **Severability:** If any section, clause, or phrase of this Agreement is judicially deemed invalid, illegal or unenforceable in any respect, the remaining parts of this Agreement shall be severed from the invalid parts and remain in full force and effect.

b. **Indemnification:** Except as otherwise limited by the Oregon Tort Claims Act, the City agrees to save and hold harmless the Agency against all claims, suits, or actions whatsoever which arise out of or result from the negligent or intentional acts of the City's officials. Employees, and agents as providing the services pursuant to this Agreement.

c. **Modification:** This Agreement may be modified by mutual written consent of the parties. Any modification to a provision of this Agreement shall have no effect upon other provisions in this Agreement unless stated in writing.

d. **Term and Termination:** This Agreement shall remain in effect until terminated by the parties as provided in this Section. Termination of this Agreement may be made by mutual consent of the parties and shall not affect the duties and obligations of the parties that occurred prior to the termination (including any bond, loan or other repayment obligations).

e. **Effective Date:** This Agreement is effective upon the latest date it is executed by the parties below**.**

f. **Entire Agreement:** This Agreement sets forth the entire understanding between the parties with respect to the subject matter of this Agreement and supersedes any and all prior understandings and agreements, whether written or oral, between the parties with respect to such subject matter.

g. **Non-Agency Relationship.** Nothing in this Agreement is to be interpreted as creating or constituting an agency relationship between the parties. Each party remains separate and neither assumes the debts or obligations of the other by entering into this Agreement.

WHEREAS, all of the form mentioned is hereby agreed upon by the parties and executed by the duly authorized signatures below.

| CITY OF SANDY | | SANDY URBAN RENEWAL AGENCY | |
|---|---|---|---|
| City Manager | Date | Agency Chair | Date |

# STAFF REPORT

| | |
|---|---|
| **Meeting Type:** | City Council |
| **Meeting Date:** | August 5, 2024 |
| **From:** | Kim Yamashita, Interim Police Chief |
| **Subject:** | Purchase Authorization: New Taser Units |

**DECISION TO BE MADE:**

Whether to authorize the purchase of 18 new Taser 10 units for deployment by the Sandy Police Department. (This expense was not anticipated in the BN 2023-25 budget).

**PURPOSE / OBJECTIVE:**

The life span of the Taser units currently on patrol is coming to an end in November of 2024. As a result, they will no longer be supported. To have enough functional Taser weapons a purchase needs to be made to update our inventory.

**BACKGROUND / CONTEXT:**

Prior to the advancement of Taser technology, most physical altercations between police and suspects were handled by the use of pain compliant techniques. Those techniques include hands on, use of paper spray, and the baton. Pain complaint techniques were and are only moderately useful, as they rely on the suspects' ability to feel and respond appropriately to pain. In the case of individuals suffering from mental health issues, or under the influence of intoxicants or drugs, that is not usually the case. When the Taser technology came out the police industry was provide a tool that does not rely on pain compliance, but rather an interruption of part of the central nervous system. It is a safe way to gain control of a suspect, minimizing the risk of injury to the suspect or the officer.

Technological Advances

The current Taser in use by SPD is the X26. All programing updates, repairs and replacements will no longer be available after November 2024. The best replacement option at this time is the Taser 10. The Taser 10 is the next generation of this weapon. Advancements in technology provide for use in scenarios where the distance between the suspect and the officer is much greater. This technology also provides better application options for suspects that are too close to the officer to make the current Taser useful. The new technology also allows for repeated (ten) deployments without reloading a new cartridge.

**KEY CONSIDERATIONS / ANALYSIS:**

The new technology of the Taser 10 provides better options for use, more reliability and should greatly decrease the need for the use of deadly force or other non-lethal options that have the potential to cause more substantial injury.

The purchase price reflects one unit for each officer and Code Enforcement, and allows for extras for spares, and new hires. The price also reflects all training equipment, cartridges, software and software updates and warranties for five years.

The Taser 10 was recently purchased by Clackamas County Sheriff's Office and the Gladstone Police Department and will soon be deployed in those communities.

**BUDGET IMPACT:**

The quote received for the Taser purchase totals $87,739.20.

As noted above, this expense requires Council authorization because it was not originally anticipated in the BN 2023-25 budget. While the majority of the cost can be absorbed within existing appropriations in the Police Fund, it is possible that a small budget adjustment will be required at the end of the biennium.

**RECOMMENDATION:**

Staff recommends Council authorization of the purchase of 18 new Taser 10 units.

**SUGGESTED MOTION:**

“I move to authorize the City Manager to purchase 18 new Taser 10 units from Axon Enterprises Inc pursuant to the quote provided in the meeting packet.”

**LIST OF ATTACHMENTS / EXHIBITS:**

- Quote from Axon Enterprises Inc

# BUDGETARY QUOTE

**Axon Enterprise, Inc.**
17800 N 85th Street, Scottsdale, Arizona 85255 United States
Domestic: (800) 978-2737 | International: +1.800.978.2737
VAT: 86-0741227

Issued: 0
Quote Expiration: 09/11/2024
Account Number: **108044**

## Customer Details

| CUSTOMER SHIP TO | CUSTOMER BILL TO | SALES REPRESENTATIVE | PRIMARY CONTACT |
|---|---|---|---|
| **Sandy Police Dept. - OR** | **Sandy Police Dept. - OR** | **Kyle Hunt** | **Normand Christian** |
| 39850 Pleasant St, | 39850 Pleasant St, | (480) 930-4484 | cnormand@ci.sandy.or.us |
| Sandy, OR, 97055-6557 | Sandy, OR, 97055-6557 | huntk@axon.com | |
| USA | USA | | |

## Quote Summary

| | | | |
|---|---|---|---|
| Program Length | **60 months** | Hardware Cost | **$68,802.86** |
| Estimated Total Cost | **$87,739.20** | Services Cost | **$5,787.18** |
| Estimated Sales Tax | **$0.00** | Software Cost | **$6,290.44** |
| Estimated FAET | **$0.00** | Warranty Cost | **$6,860.21** |
| Est. Total Cost w/ Taxes | **$87,739.20** | | |

## Discount Summary

| | | | |
|---|---|---|---|
| Quote Unbundled Price | **$105,947.49** | Average Savings per year | **$3,641.66** |
| Quote List Price | **$87,739.20** | Total Savings | **$18,208.29** |

## Bundle Summary

| Bundle Name | SKU | Quantity | Unbundled Price | Net Total |
|---|---|---|---|---|
| **BUNDLE - TASER 10 CERTIFICATION**<br>Includes: T10 Handle, Battery, Magazine, Holster, Dock (with power cord & mount), TASER Ecom license, HALT Suit, Target & Frame, Cartridges and cartridge deliverables. Intended for 5yr term. | C00010 | 18 | $105,947.49 | $87,739.20 |

## A la Carte

| Product | Category | SKU | Quantity | Net Total |
|---|---|---|---|---|
| *No Products have been added.* | | | | |

## Billing Schedule

| Time Period | Final Price without Tax | Tax | Final Price with Tax |
|---|---|---|---|
| Year 1 | $17,547.84 | $0.00 | $17,547.84 |
| Year 2 | $17,547.84 | $0.00 | $17,547.84 |
| Year 3 | $17,547.84 | $0.00 | $17,547.84 |
| Year 4 | $17,547.84 | $0.00 | $17,547.84 |
| Year 5 | $17,547.84 | $0.00 | $17,547.84 |
| **5 Year Plan** | **$87,739.20** | **$0.00** | **$87,739.20** |

**Non-Binding Budgetary Estimate**

1703

- This Rough Order of Magnitude estimate is being provided for budgetary and planning purposes only. It is non-binding and is not considered a contractible offer for sale of Axon goods or services.
- Tax is estimated based on rates applicable at date of quote and subject to change at time of invoicing. If a tax exemption certificate should be applied, please submit prior to invoicing.
- In order to complete this sale, a valid Federal Firearms License is required for the premises to which any firearms will be delivered. We are required to have and keep on file a digital copy of the signed license.